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SURGICAL CLINICS OF CHICAGO

Volume 2 Number 4

CLINIC OF DR. L. L. McARTHUR

Michael Reese Hospital

TUMOR OF THE PITUITARY GLAND—TECHNIC OF OPERATIVE APPROACH

Summary: Patient thirty-five years of age, who has been suffering from severe headaches at intervals for two years; diagnosis based on symptoms of intracranial pressure and the *x*-ray findings; operation; the McArthur frontal approach; postoperative course.

This patient, B. D., aged thirty-five, was referred to the operator by Dr. Hugh T. Patrick. The patient's general health through life has been good. Two years ago he suffered with severe headache, which was always frontal in character, not unilateral; unaccompanied by vomiting. He is a heavy smoker, but uses no alcohol.

While the patient is being prepared I shall read abstracts of the reports of the neurologists and other specialists who have studied this case and assisted in making the diagnosis.

May 17, 1918: At Michael Reese Hospital. Had *x*-ray pictures taken, which showed decided excavation of sella turcica. Ocular examination at that time revealed a left hemianopsia. Dr. Sidney Kuh, after examination, regarded the condition as nervous breakdown; advised against operative interference.

In August, 1917, was operated upon by Dr. R. H. Good for left frontal sinus disease, finding same purulent. After enlarging the duct, sinus washed out two or three times weekly, headache was alleviated very much.

Letter of reference by Dr. Hugh T. Patrick, viz.: "I think there can be little doubt that patient has a tumor of the hypophysis. The symptoms point to it and the *x*-ray plates show large excavation of the sella with disappearance of the posterior wall. There are two peculiar features to the case: one is a leukocytosis which is difficult to account for and the other is a monocular hemianopia. It looks as if the tumor of the hypophysis has arched over the chiasm and has invaded the left optic nerve alone. This being the case, I think it would be exceedingly difficult to relieve this pressure by operation through the nose, and consequently believe that your frontal operation would be the proper route of attack in this case."

Dr. R. H. Good, in referring the case, stated: "Last August I operated his left frontal sinus, intranasally, washed out pus from the sinus, and have been off-and-on washing out more or less quantities of pus from the sinus ever since. The *x*-rays have never shown any extensive granulation formation in the sinus."

Blood Examination (March 30, 1918):

Red cells	4,000,000
White cells	7,000
Polymorphonuclear neutrophils	72 per cent.
Polymorphonuclear eosinophils	0 per cent.
Polymorphonuclear basophils	0 per cent.
Large mononuclears	3 per cent.
Small mononuclears	25 per cent.
Myelocytes	0 per cent.
Transitional	0 per cent.
Hemoglobin	85 per cent.
Color index	1
Nucleated red cells	Negative
Polychromatophilia	Negative

Remarks: No parasites. No poikilocytosis.

Having heard the abstract of the medical history of this case, which I am about to explore for a tumor supposed to be in the neighborhood of the pituitary body both by the internists and the neurologists of the staff of this hospital, I desire to invite your attention to the route to this neighborhood, which in a former communication to the American Medical Association I recommended some years ago at Atlantic City. I feel that I have been decidedly complimented by the acceptance of the same by the leading operators of this country, particularly Dr. Charles Frazier, of Philadelphia, who has modified it in a slight degree as to the removal of the bone in two pieces instead of in one. The desirability of a route by which a good view and an aseptic field for operation are obtainable cannot be questioned. Hence, to the general surgeon, any operation done through the nose or mouth is objectionable on both the limited field of vision basis and the septic tract through which the operation must be performed.

If one will examine a skull the top of which has been removed one will see at a glance that if the frontal prominence with the supra-orbital ridge be removed one can easily reach with an index-finger the site of the pituitary body. Briefly, the technic of the operation is as follows:

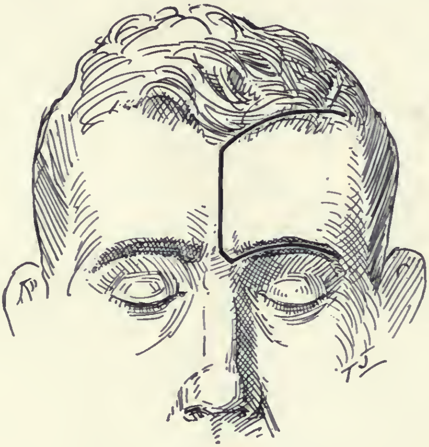


Fig. 217.—Line of skin incision.

Technic.—The surface having been prepared and sterilized and the eyebrow having been shaved, an incision is made from the midline in a horizontal direction, following the curve of the eyebrow and made in the hair-line, to the outer extremity of the orbit; then a perpendicular incision is made in the middle line of the forehead to the hair-line, and then curved outward to the same side, cutting everything down to the bone (Fig. 217). It is then possible to reflect a flap of the soft tissues with the periosteum included. With this soft tissue flap retracted laterally, one then makes a small button perforation at the upper portion of the exposed frontal bone, through which it is possible with the DeVilbiss forceps to make a curved cut in the bone that will extend from the internal orbital angle upward and outward and

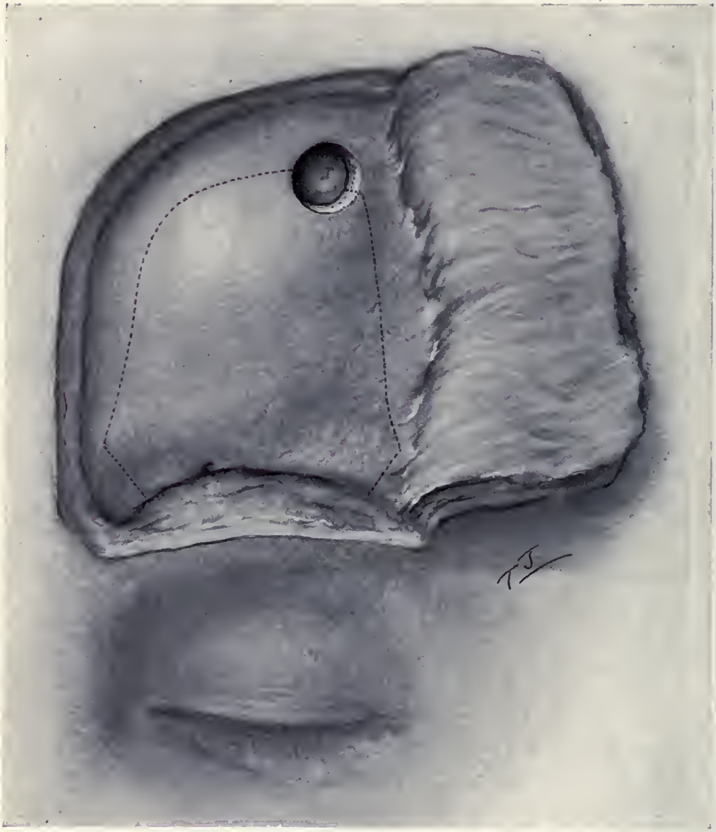


Fig. 218.—Flap of soft tissues retracted laterally; outline of bone incision and button of bone removed to afford point of application for the DeVilbiss forceps.

downward to the external orbital angle (Fig. 218). When this has been cut, the supra-orbital arch is then divided obliquely by means of a small circular saw, or osteotome, so that when replaced it will act as the keystone of an arch which has at either end an oblique support.

When this has been done it is possible to pry out the fragment of bone outlined, and with it will come the greater part of the roof of the orbit. Before prying it out, however, the periosteum lining the roof of the orbit should have been carefully loosened from the bone in order that the structures contained within the orbit will still be protected by its periosteal envelope. When this piece has been removed, it should be placed in normal sterile salt solution and carefully maintained at blood heat until ready for replacement at the conclusion of the operative interference. On its removal there will come into view the anterior portion of the frontal lobe of the brain with its dural covering. In this particular instance, notwithstanding the fact that careful investigation had been made of the frontal sinus, which sinus had been under treatment for some months, having been drained through the enlarged nasal duct, we find it to be filled with pus, and must discontinue our operative interference until this septic process has been destroyed. To do this we will remove the posterior bony wall of the frontal sinus, all of its lining mucous membrane, and pack with iodoform gauze in such a way that the end of the packing can be removed through the nasal sinus, it being deemed inadvisable to open the dura in the presence of a suppurative process.

(Three weeks later, the patient being free from all temperature, and with no discharge from the nasal duct leading to the remains of frontal sinus, the wound was reopened, the fragment of frontal bone again elevated and put in salt solution, and the frontal sinus found to have been obliterated by a mass of granulation tissue completely filling same. The operation was, therefore, proceeded with at the point at which it had been arrested by the finding of pus within the frontal sinus.)

In order to secure good exposure the balance of the roof of the orbit well back to the exit of the optic nerve is easily removed by means of small rongeur forceps, which bite off the bone piece by piece, care being taken all the time not to injure the periosteum, which has been detached from the bone before its removal (Fig. 219). When this is accomplished, it is then feasible with an ordinary teaspoon or orange spoon to depress the contents of the orbit very considerably, and with a teaspoon, tablespoon, or other brain retractor it is possible to so elevate the frontal lobe, encased in its dural covering, as to gain a view of the corresponding optic nerve within the cranium. With this as a guide, further gentle loosening of the dura enables one to feel with the finger the entire free edge of the sphenoid wing, and, with this means of orientation, to recognize the anterior clinoid process. With gentle handling and sponging of the small amount of venous oozing one will soon perceive the opposite optic nerve coming into view with its dural covering. Having the frontal

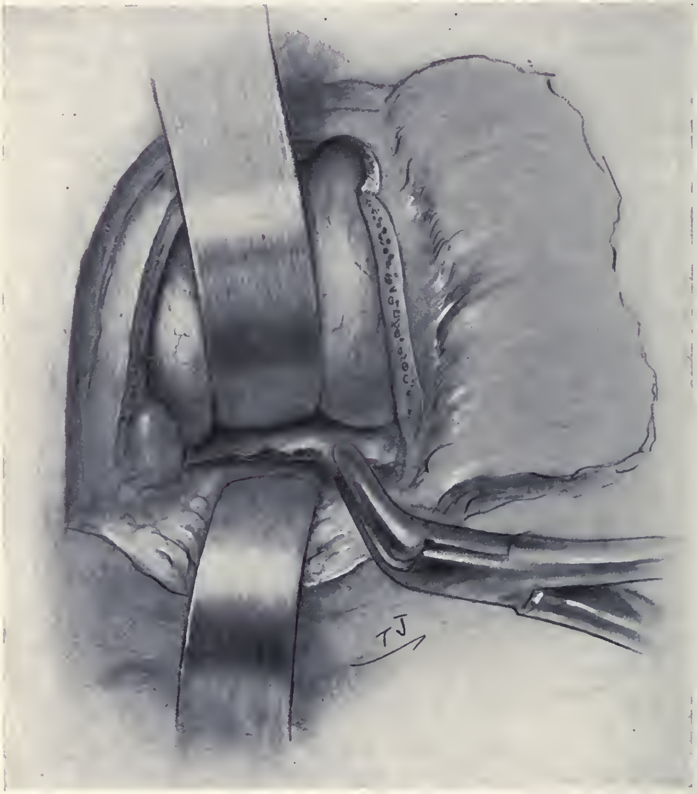


Fig. 219.—Roof of orbit removed by means of rongeur forceps. Dura elevated and orbital contents depressed with flat retractors.

lobe so elevated and exposed, and having the anterior margin of the sella turcica localized, one makes a transverse incision in the dura, about 1 cm. in front of the position of the chiasm (Fig. 220). When this is made, not infrequently considerable of the cerebrospinal fluid escapes from the cisterna. With this mopped out, it is possible to see the horizontal diaphragm of dura covering in the pituitary body when normal—the convex elevation of the same when distended and pushed upward by a pituitary tumor (Fig. 221).

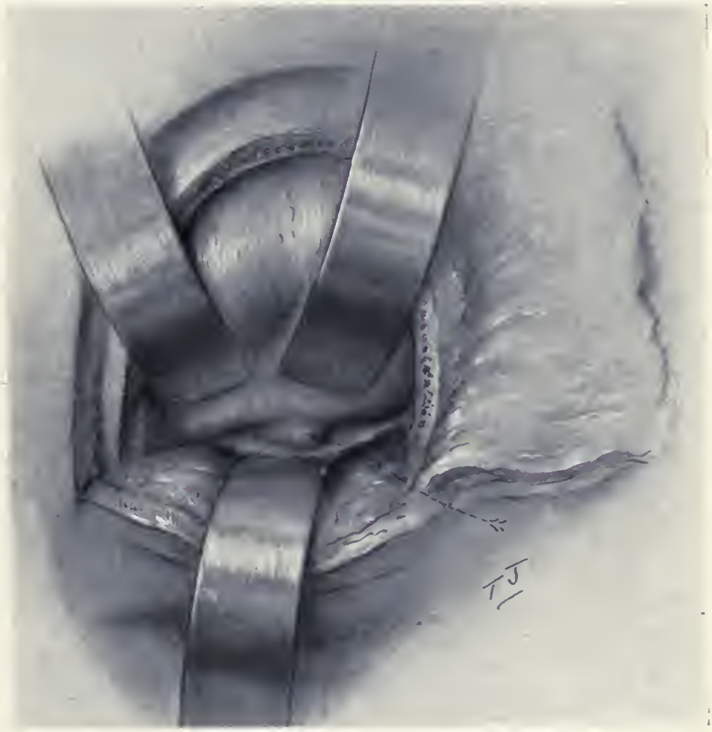


Fig. 220.—Site for incision in dura.

We have been fortunate in having an artist with us who, at the various stages of the operation, has been given an opportunity to make sketches of them. He will, for the purposes of future illustration, complete these for the records. The drawings, therefore, will not be schematic, but will be as actually seen.

With our dura open and the frontal lobe elevated, the orbital contents depressed by means of an ordinary teaspoon, we are able to see both optic nerves and their junction in the chiasm; we are able to see the cerebral artery, but find neither in the sella turcica nor in that portion of the frontal lobe lying in immediate contact therewith any abnormal structure, and must, therefore, desist; the probable localization as determined by the left hemianopsia having been faulty. No attempt is made at suture of the dura; the frontal lobe and dura are allowed to fall upon the periosteum covering the orbital contents; the bony fragment is

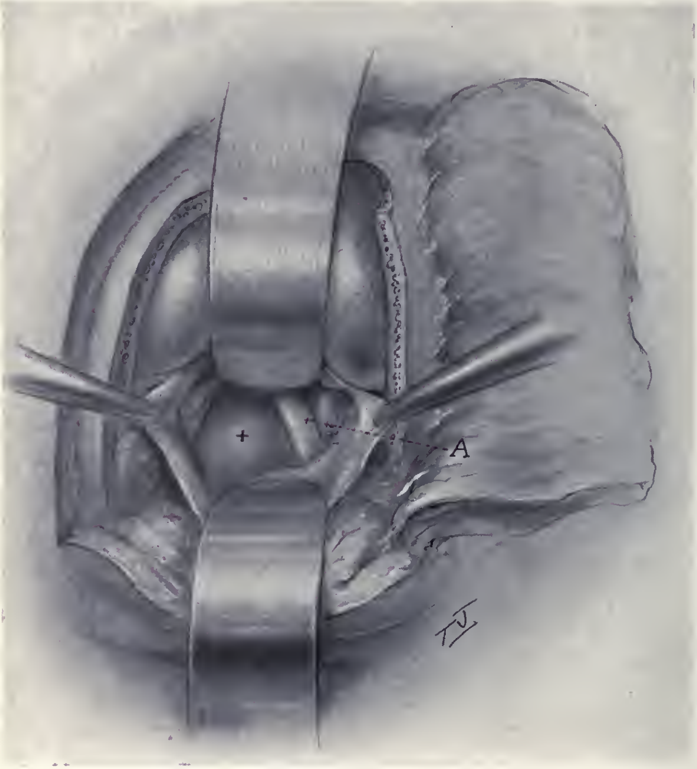


Fig. 221.—Dura incised: *A*, Optic nerve; +, point for attacking hypophysis.

replaced, and the periosteum sutured over it. A silkworm-gut drain brought out at the inner angle of the incision and closure by continuous suture of the wound completes the exploration.

Postscript.—Healing *per primam;* stitches removed on the sixth day; and now, five weeks after the operation, the only wound to be seen is the perpendicular mesial red line extending upward to the hair, which covers the lateral arm of the incision, the eyebrow having grown out, covering the supra-orbital incision. An *x*-ray picture taken at this time shows the outline of the bone fragment which was removed in order to afford access to the pituitary. As yet there is but little evidence of bony bridging of the line of incision (Fig. 222).

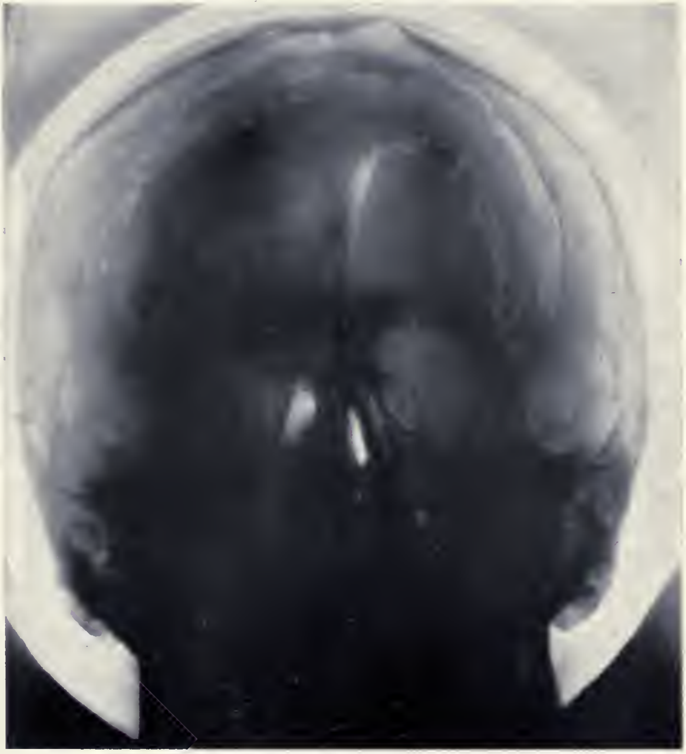


Fig. 222.—*x*-Ray picture of skull five weeks after operation. There are as yet very few signs of bony closure of the tract made by the DeVilbiss forceps.

CLINIC OF DR. KELLOGG SPEED

BASE HOSPITAL IN FRANCE

TRANSARTICULAR CAPSULORRHAPHY ON THE KNEE

Summary: A day in the operating theater of a Base Hospital in active service—necessity of speedy, accurate, decisive grouping of patients—the omnipresent sepsis; the first patient—a gunshot wound of the knee—necessity of immediate application of splints in knee injuries; technic of examination and operative treatment in present case; suspension of the leg a great convenience; the dressings; subsequent clinical course.

A DAY in the operating theater for the clinical surgeon on active service is not so much unlike a day in his own hospital at home. That means, of course, that all his resources, both mental and physical, are on tap. During his operative hours, which cannot be too long in these days of continued battle, he is intensely occupied with technical work. Diagnostic acumen must be sharper than in peaceful times, because under the present circumstances many of the men to be operated on are not seen by the surgeon until they are on the table. Decisions governing choice of anesthetic, wisdom of operating on any given wound, and the method of choice must be made quickly. So great is the pressure that the operator must abandon his civil habits—he cannot see his patients the night before, make careful physical examination, and require helpful laboratory tests. If medical officers have passed on the necessity for operation and sent the patient to the theater, their decision must be accepted up to that point.

The patients are easily divided into three groups—those received shortly after injury, on whom early radical excision and operation for foreign body removal may be practised, and those received too late for such steps, who must be cared for by foreign body removal with indicated drainage. The gas infections and secondary hemorrhages are in a class by themselves.

The former require subdivision into three classes, those still localized, favorable; those complicated by septicemia; and those not accompanied by general reaction, which are not favorable for operation.

The surgeon, then, must weigh many considerations, but beneath all he must consider the omnipresent sepsis which threatens all patients. Each day's work means decisions for and against amputation, looked at in the light of war experience with sepsis, questions of the advantage or disadvantage of exploration near blood-vessels, of the advisability of skull and brain operations, and the intense necessity of closing open joints against infection arising around them.

Rapidity in operation is even more desirable than in civil work. The time of the operating-room force must be conserved. One ordinary operator with bandaging assistants and two anesthetists can easily keep three tables going. Minor operations, especially those requiring only gas anesthesia, can be sandwiched in between more serious ones, so that it is no great effort for a trained surgeon to care for 20 patients in the course of a morning.

The first patient this morning, with a gunshot wound of the knee, is one of the type on whom we like to operate as soon as possible after their arrival. He is J. C., 18,088, Gnr. — Bde, RFA, injured just forty-eight hours ago, passed through a field ambulance and sent down to us at once, with no more attention than a dressing and a Thomas splint—the very best treatment possible. Knee-joint injuries, no matter how slight they appear, should always be splinted at once. Operative treatment should follow as soon as consistent with existing conditions, and the patient should never attempt to walk until he is recovering and given medical permission.

When we examine the knee we find the wound of entrance just above the patella in the middle line. There is no exit. The joint is slightly distended and is a little tender, and from the appearance of the ragged edges of the wound it seems that a piece of shell was the cause. No matter which way that fragment went after entering the tissues, it must surely have penetrated the subcrural pouch of the joint. We make urgent request for two-way skiagrams and x-ray localization of our joint, chest, and head injuries, and we have the plates here. Even if they were not available, it seems better to excise this wound, to close and protect the joint immediately, than to put off that step until the joint is hopelessly infected. An experienced surgeon will usually find foreign bodies without x-ray assistance, but unless it is absolutely impossible he should be furnished that aid. His work is then more rapid and far less destructive.

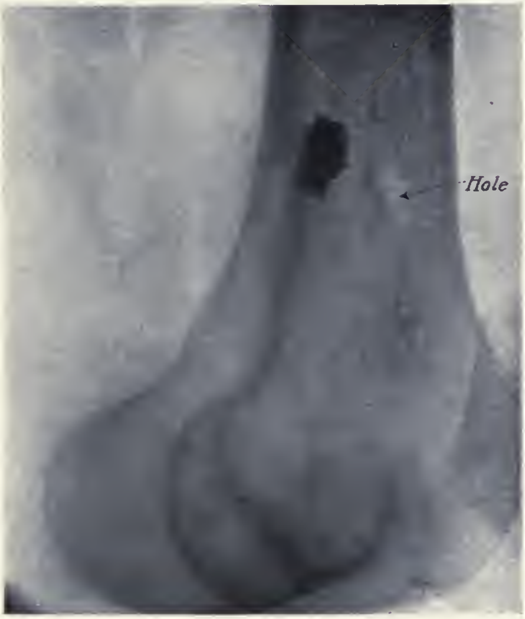


Fig. 223.—Lateral view, showing foreign body hugging the femur, and the hole in the shaft through which it passed after traversing joint.

Examination of the plates shows that the foreign body lies just alongside the femur on the inner border of the shaft above the supracondylar expansion of the bone (Figs. 223 and 224). The localization ring is here, right over the bone, and the depth mark is just at the femur level. The operating procedure is clearly indicated. We know there is a retained foreign body, we know where it is, we are also reasonably certain that the joint has been perforated, and that it still remains without noticeable infectious reaction. Our indications are to excise this soiled wound of entrance down to the joint, to determine the condition of the joint and remove any untoward foreign contents, to close the joint and entrance wound, and then to make a separate incision through the inner side of the lower thigh, and remove the foreign body.

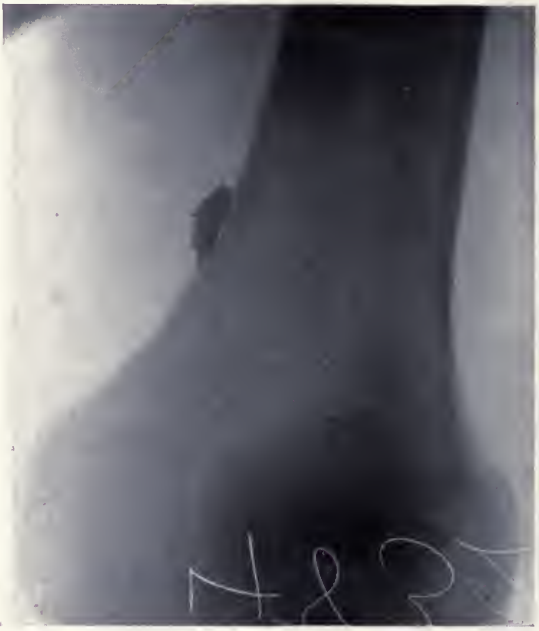


Fig. 224.—Anteroposterior view, showing foreign body on inner side of femoral shaft after having pierced the bone.

The orderly is using ether soap on the soiled skin of the leg and thigh. You note that we hold the whole leg up off the table by means of an adjustable overhead sling with a rubber tubing loop to hold the foot or splint end (Fig. 225). One orderly can thus elevate the whole limb, tie the rope so that any desired angle of elevation is obtained, and then proceed alone to prepare the patient. War is no respecter of human anatomy—we must make easy our method of preparing any part of the leg.

The skin has now been shaven from mid-thigh to mid-leg and after washing with methyl alcohol, a 5 per cent. solution of picric acid in alcohol is painted on and allowed to dry. A constrictor is then tightened about the thigh and the operative field is protected by towels, while the leg is still in suspension.

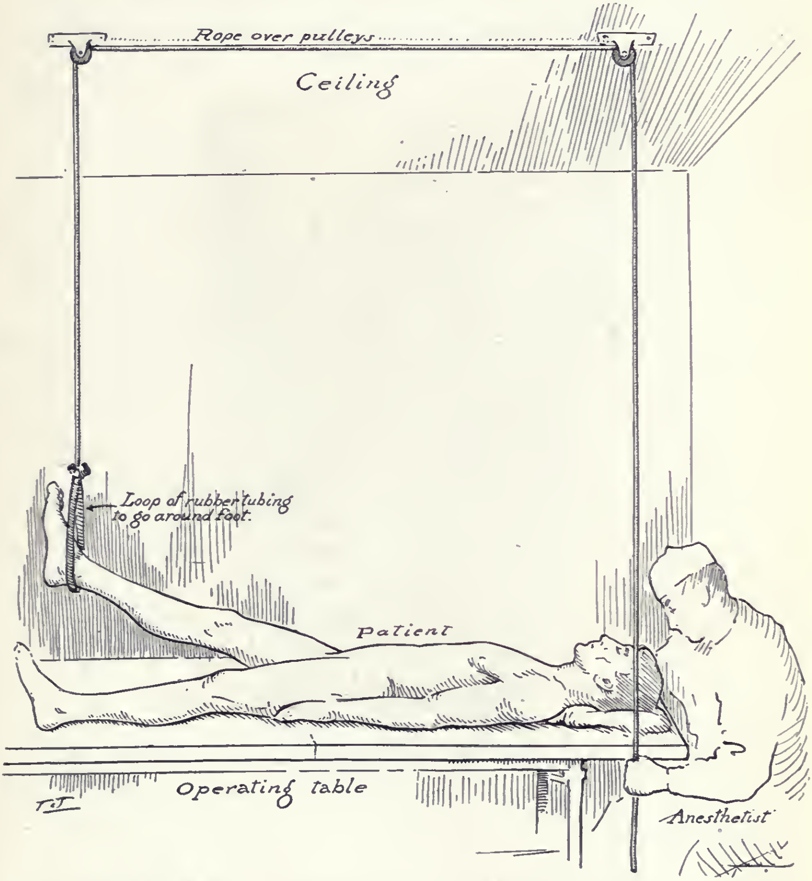


Fig. 225.—Method of suspending leg to minimize number of necessary assistants both in the "scrubbing up" and in the actual operative work. By thus suspending the limb greater freedom from possible contamination of the wound by contact is also obtained.

Early and careful exploration of the knee-joint should always be done with a constrictor on the thigh, and with the leg swung up, thus there is little or no possibility of contact with table or rubber sheet, and the joint itself can be fully exposed by necessary incisions without risk of moving and irritating it. Sponging is unnecessary and the rapidity of the work is greatly enhanced.

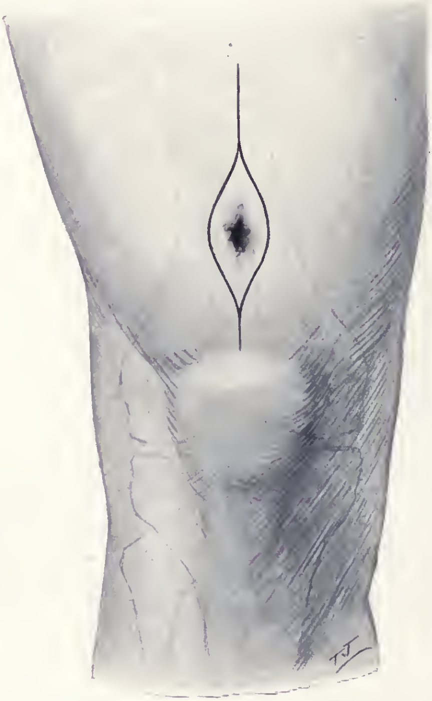


Fig. 226.—Contaminated wound of entrance; incision carried through clean tissues.

My incision extends from the upper border of the patella toward the top of the subcrural pouch, going around the wound of entrance, the soiled tissues of which are cut away clear down to the synovial surface (Fig. 226). Now I trim the synovial surface, and the joint within looks clean and healthy. Gentle retraction which does not impinge on the synovia demonstrates a second hole in the lower reflection of the subcrural pouch

(Fig. 227). Beyond that I cannot see. Before going further let us pick up this deeper hole and trim the torn edge of the synovial surface about it. Having done so, I am going to use my other eyes—the index-finger of my left hand, which I pass gently through both the synovial openings. Beyond I feel a hole punctured clear into the femoral shaft, but with the advantage of my x-ray information I know that the missile has passed clear through the bone and now lies just beyond it (Fig. 228). Without attempting to clean the hole in the bone, which would mean the dragging of potentially infected material up through the joint for delivery, I am going to adopt a method I frequently employ under similar circumstances, namely, I shall do a transarticular capsulorrhaphy on this hole in the deep reflection of

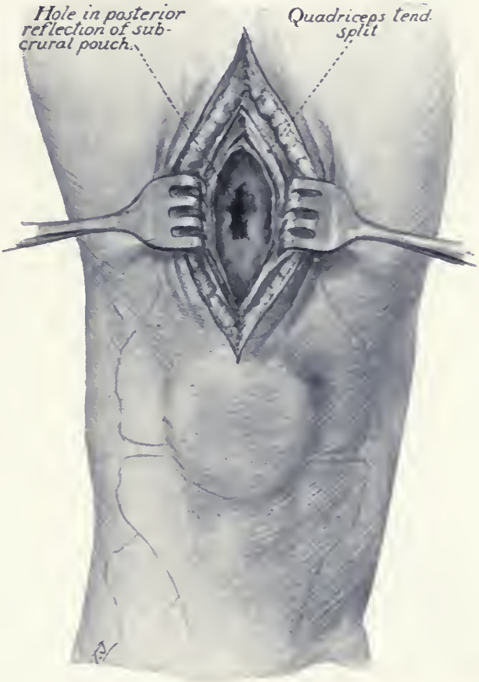


Fig. 227.—Subcrural bursa laid open; the hole in the underlying femur is brought into view.

the subcrural pouch, and then—and not until then—will I wash out the joint. You saw the large clots I gently lifted out when I first opened the joint. When the deep hole is closed by this catgut stitch I can wash out the joint with normal salt solution without leakage from the articulation pouch into the tissues behind, and without the possibility of solutions which have penetrated deeper filtering back into the joint. You must recall that the anterior opening has been completely excised until there are present no soiled tissues which have come in contact with the missile and which were infected by it. The only contamination present on the synovial surface is that from continuity of

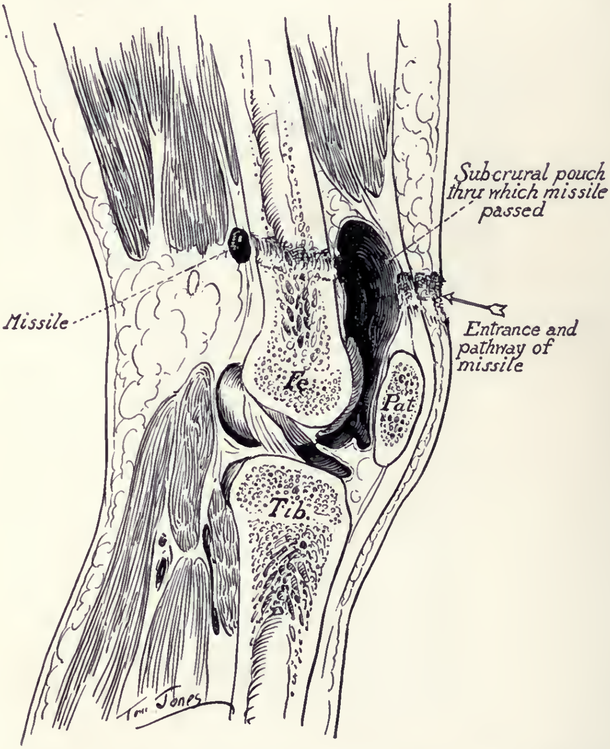

Subcrural pouch thru which missile passed
Missile
Entrance and pathway of missile
Fe.
Pat.
Tib.
Tom Jones

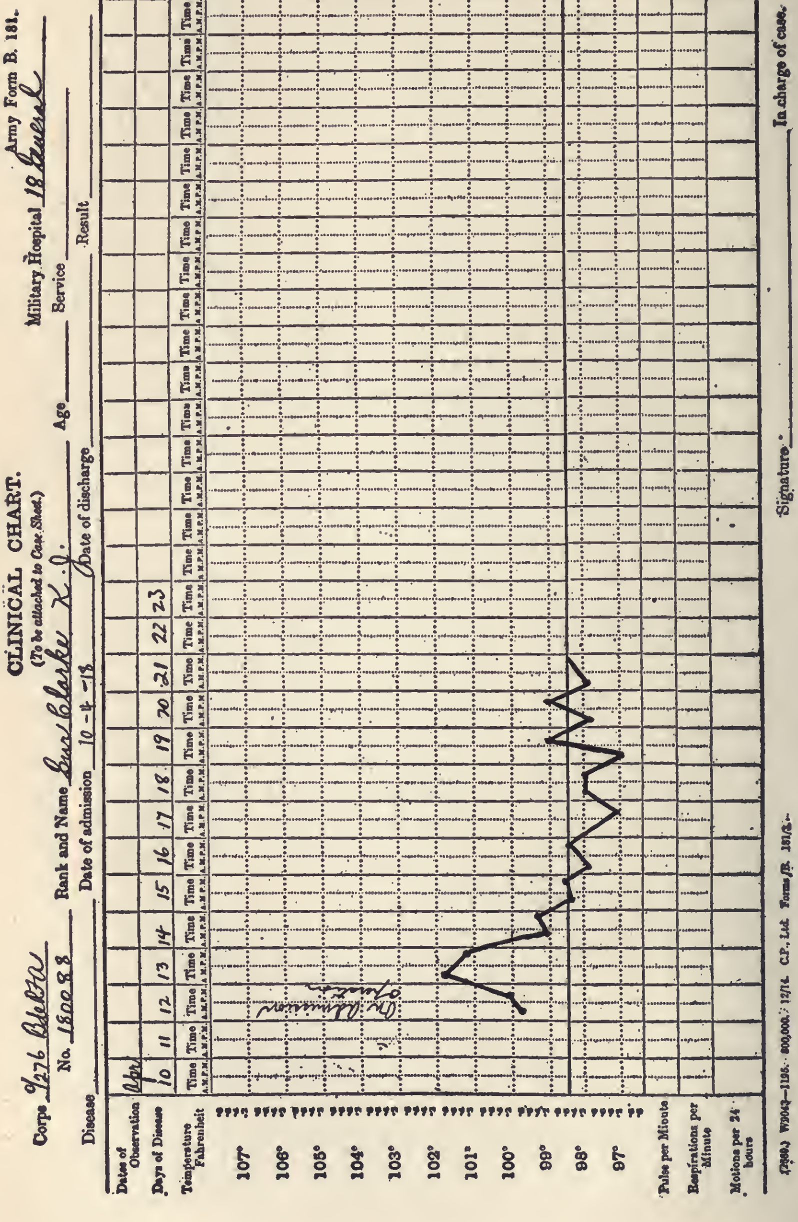
Fig. 228.—Tract of missile and its final location; it has passed through the quadriceps tendon, the subcrural bursa, and the femur into the popliteal space.

the punctured wound, or from the clots—this will be cleansed mechanically and very gently by the salt solution. Granted that the joint might remain sterile without operation, removal of the clots and lavage of the synovial surface will go far toward avoiding the formation of intra-articular adhesions. If sepsis develops within the joint, clot removal should favor a less extensive process, because the joint surfaces will tend to lie in apposition and prevent the spread of the infection.

The joint irrigation is finished and I am closing the hole in the upper synovial surface of the subcrural pouch. After that the cut-away edges of the quadriceps tendon and muscle are closed separately, and lastly the skin is brought together—three rows of protection in front of that joint, and its posterior wall closed off from the missile's tract into the bone. If the infection has not great headway—and it did not show any such signs to our inspection—we expect that joint, at the very least, to take care of itself and its usefulness to be conserved. After caring for several hundreds of these patients we know that is entirely reasonable to anticipate. We may expect a smooth recovery and a functionating joint in 80 per cent. of early operated knee penetrations.

Through a separate incision on the inner lateral surface of the thigh I very quickly come down to and extract the foreign body—here it is. This second incision I shall not close at all—if there is a development of sepsis here I wish it to empty itself out through this opening—not to press forward on the bone, nor against the joint, threatening it.

The dressings are applied, and now we come to one of the most important steps in the treatment—the application of the Thomas splint. The leather-padded ring of the splint must be of a size 2 inches larger than the measurement of the upper thigh, to allow for the pads and the diagonally set ring. Supports of perforated zinc stiffened by a piece of Gooch splint and padded with shell dressings hold up leg and thigh on to the side pieces of the splint. To steady the limb we use a mild traction gauze applied to the sides of the leg held by Sinclair's



CLINICAL CHART.

(To be attached to Case Sheet.)

Army Form B. 181.

Military Hospital 18 General

Corps 9/276 Bde RFA

No. 180088

Rank and Name Gnr Clarke K.J.

Age

Disease

Date of admission 10-4-18

Date of discharge

Service

Result

Signature

In charge of case.

Fig. 229.—Clinical chart showing temperature curve of patient operated on.

glue[1] and tightened at the end of the splint. More pads on top and two snug flannel roller bandages hold everything firmly. A foot support is applied and the foot is padded and bandaged comfortably in a right-angle position.

Clinical Course.—A glance at the temperature chart shows the sudden rise of fever just after operation and its prompt subsidence (Fig. 229). There was little pain in the rigidly held limb. Stitches were removed on the tenth day, the skin was healed, and the joint was negative. The patient contracted a slight cold in the ward which deferred his departure to England, but he left a few days later in excellent condition with every prospect of ultimate normal function in his knee.

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[1] Ordinary glue (gelatin when glue is not obtainable), 50 parts; water, 50 parts; glycerin, 2 parts; calcium chlorid, 2 parts; thymol, 1 part. Heat glue to 100° F. in water-bath.

CLINIC OF DR. ARTHUR DEAN BEVAN

Presbyterian Hospital

HEMANGIOMA OF THE SCALP

Summary: A child, ten months of age, dying of hemorrhage from a huge, ulcerating hemangioma of the scalp; treatment by ligation of common carotid artery and internal jugular vein of the affected side; later history—obliteration of remnants of tumor by injections of boiling water.

May 6, 1918.

I want to present to you this morning a rare emergency. This child, about ten months of age, is dying from hemorrhage from an ulcerating hemangioma of enormous size, involving the entire right side of the skull and neck (Fig. 230). The hemoglobin is about 35 per cent. The hemorrhage has persisted for the last ten days and cannot be controlled by pressure, which, if sufficiently firm, simply extends the ulceration. As you see, the bleeding surface is on the back of the neck and behind the right ear.

I am going to undertake a very unusual and heroic method of treatment in this case, and one which undoubtedly carries a very great risk to the child. I believe, however, it is warranted by the fact that unless you can check this hemorrhage the child will surely die within the next few days. Under ether anesthesia I am going to ligate the common carotid artery and the internal jugular vein on the right side. This will control both the arterial and venous circulation of the area occupied by this large hemangioma. It will, of course, carry a very great risk of cutting off the circulation of the right side of the brain and producing death from brain softening. The operation of ligating the common carotid and internal jugular vein is formidable not because of any difficulties in technic, but because of the enormous risk of cutting off the brain circulation and producing death from brain necrosis. The technic of the operation is comparatively simple.

We have protected the ulcerating area with sterile dressings after touching the raw surface with tincture of iodin. The field of operation is prepared simply with soap and water and alcohol. I make, as you see, an incision along the inner border of the sternocleidomastoid and extending from the thyroid cartilage down about 3 inches, which in the short neck of this child brings it almost to the sternoclavicular articulation. I now divide, in addition to the skin and superficial fascia, the platysma and deep cervical fascia. Drawing the sternocleidomastoid to the outer side I now expose the sheath of the great vessels of the neck; running in front of this is the descendens hypoglossi nerve, which is readily recognized and avoided. The common carotid is easily exposed, overlapped as it is by the huge internal jugular vein, the jugular vein in this child's case being as large as my index-finger.

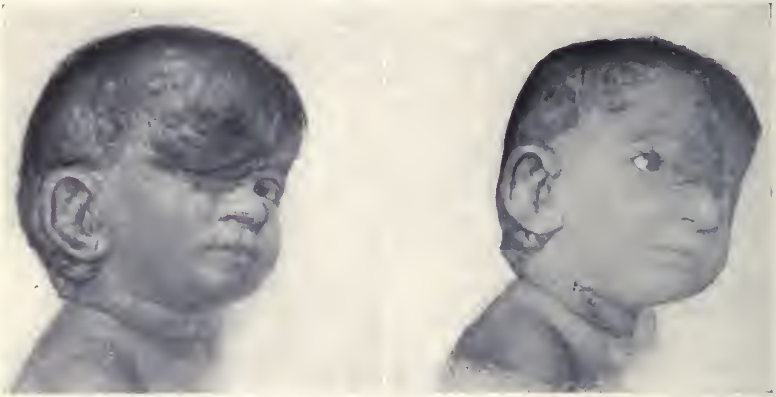

Fig. 230. Fig. 231.

Fig. 230.—Huge ulcerating hemangioma of the scalp before operation.

Fig. 231.—Ten days after operation. The tumor is rapidly disappearing with the exception of the portion above the inner canthus of the right eye. This was later obliterated by injections of boiling water.

I now pass an aneurysm needle under the common carotid, being sure that I expose it fully and do not injure the pneumogastric nerve, which is just behind it. I ligate it with medium-sized catgut ligatures. It is well in a case of this kind to ligate the artery first, so as to cut off the arterial circulation and allow a brief period to intervene, so that the venous channels can empty themselves before ligating the internal jugular vein. I now in the same way ligate the internal jugular vein, and then close the wound with fine catgut buried sutures and silk through the integument. No drainage is employed.

No apparent impression is made upon the child while it is under the anesthetic from this double ligation. Our only hope in this case is that the circle of Willis is sufficiently free from the left side to carry nourishment to the right side of the brain.

After-history.—The child went on to a good operative recovery without any cerebral symptoms appearing. The hemorrhage from the ulcerating hemangioma ceased. The very thick spongy hemangioma changed very perceptibly in character within twenty-four hours to a hard, firm mass, caused by the coagulation of blood in the large vessel spaces in the tumor. This coagulation extended throughout the entire mass with the exception of a small area at the upper and inner angle of the right eye. Here there was no change whatever in the character of the hemangioma, due evidently to the fact that the circulation which was derived from the vessels coming out from the orbit, the supra-orbital vein and artery, was not controlled by the double ligation. The ulcerating area of the hemangioma healed very slowly and there was for a number of weeks a marked tendency for the tissues to break down, evidently because of the very limited blood-supply of the tissues after ligation. Gradually this condition improved. The blood-clot in the tumor was gradually absorbed, and the integment over the tumor, which before operation was bluish in color, gradually whitened out and the entire hemangioma with the exception of the limited area supplied by the supra-orbital vessels gradually disappeared (Fig. 231).

The problem then remained of handling that part of the hemangioma at the upper and inner angle of the orbit. I decided to do this with injections of boiling water. It was necessary to repeat these injections three different times, using about 60 minims in each injection, putting in probably 30 minims in two different localities in the tumor at each sitting. This was done without anesthetic and with a syringe especially constructed for this purpose.

This was followed by marked diminution in the hemangioma. At the time the child left the hospital this part of the hemangioma had also almost entirely disappeared.

I am glad to have had an opportunity of observing this case, as it demonstrates very well the control afforded in these cases of hemangioma by cutting off both the arterial and venous circulation. I am quite sure that experiences of this kind must be rare, and that we would not be warranted in drawing too definite conclusions from the results in this single case.

SKIN-GRAFTING: AN EXTENSIVE BURN OF THE CHEST REPAIRED BY THIERSCH GRAFTS

Summary: A child, seven years of age, who had suffered a third degree burn of the entire anterior surface of the chest four months previously; necessity of skin-grafting; autogenous grafts indispensable; sterilization of the field to be grafted; the Thiersch graft—how prepared; method of application to raw surface; superiority of dry dressings.

May 10, 1918.

I WANT to present to you today the case of a little girl, seven years of age, who four months ago was very badly burned by her clothing catching fire. The burn extended over the entire anterior surface of the chest and abdomen to the umbilicus, the anterior surface of the neck up to the chin, and the anterior surface of the shoulders and upper arm to a point about midway between the shoulder and elbow. She was fortunately in the hands of a very competent medical man, who took immediate charge and by good management saved the child's life. The burn for the greater part of its extent was of the third degree, destroying completely the integument, and after the sloughs of dead skin came away there was an area probably 12 by 15 inches in extent completely denuded of integument. After the separation of the sloughs the area exposed was treated by paraffin dressings. These gave her a good deal of relief, but had the disadvantage of retaining a lot of pus on the surface, from which she had an absorption temperature ranging from 101° to 102° F. The dressing of the wound was a very serious matter because it was very painful, and the child was very nervous and struggled and protested during the dressings. When the dressings were changed to moist boric dressings, so as to pick up the suppuration, the temperature would fall to approximately normal, but these moist dressings were very painful to the child and had to be discontinued.

Several weeks after the immediate danger of death from the burn had passed, the area was skin-grafted, the skin-grafts being taken from her mother and father and from some other relatives and friends. The grafts apparently took very nicely and looked at the end of a week or ten days as though they would live and cover the surface. At the end of that time, however, the grafts melted down and disappeared, leaving the surface almost in the same condition as it was before.

Some weeks later the skin-grafting was repeated, and with almost identically the same results. For a short time the grafts looked very favorable, but later melted down in the same way. The child was brought to our service at the Presbyterian Hospital a few days ago.

In analyzing the facts in the case it is evident that it is extremely important to cover this huge area, which is about a foot square, with skin-grafts to complete the wound healing and stop the suppuration, which if continued indefinitely would threaten the child's life. The temperature, as I have said, varies now from 101° to 102° F. She is confined absolutely to bed on her back. She has been, by good nursing and good medical management, kept otherwise in very fair condition.

As I analyze the facts in this case from the light of a good many similar cases which we have had in the last few years, I believe that there is but one way of handling it that will enable us to cover this enormous surface and get rid of this suppuration, and that is by grafting upon this great surface, after we have made it surgically perfectly sterile, not the integument taken from other people, but skin taken from this child herself. Before we do the operation I want to present this problem pretty fully to you.

You remember, in the development of skin-grafting, Reverdin, of Switzerland, first suggested skin-grafting by the simple method of picking up little pieces of skin with a sharp hook and snipping them off with a pair of sharp scissors and then placing these small skin-grafts on the granulating surface. If they took, they became islands of epidermis which gradually grew, sometimes each one to the size of a dime or more, and if the operation was successful, covered eventually the area involved. The Reverdin grafts had a very limited field of usefulness. In the 80's Thiersch devised the scheme of skin-grafting which is known in the literature by his name. This consists not in taking small islands of skin, but of splitting the normal skin with a sharp razor, leaving one-half behind and using the other half for the skin-grafting. With good technic large strips of skin, 1 inch or 2 inches wide and 3 or 4 inches long, can be obtained. In Thiersch's early work these were applied directly to the granulating surface and were kept in contact with the surface by strips of gutta-percha tissue or magnesium, and over this was applied moist dressings of normal salt solution. I had the opportunity of seeing a good deal of the work done by Thiersch, as I was a student in his clinic in Leipzig in the years 1892 and 1893, and Thiersch obtained very admirable results with his method.

There have, however, been some very distinct improvements made since that time. First of all, we have found that the grafts are much more apt to take if we scrape off the granulations from the area before we apply the graft, and in the second place, instead of moist dressings, which prove efficient in a large percentage of cases, to be sure, we have found that perfectly dry dressing gives a larger percentage of successes, and, in the third place, we have found by a good deal of experience, and I have confirmed this in my own work, that grafts taken from other individuals seldom live. I think it would be a fair statement to make that not more than 10 per cent. of the grafts taken from other individuals will heal in and remain permanently. To make the matter still stronger, I should say that there is ten times the probability of the grafts taken from the same individual living after their transplantation than grafts taken from other individuals. I do not believe that this very important fact is generally recognized by the profession. Every few months one picks up a paper describing a case of skin-grafting in which the relatives of the patient or the friends or fellow employees of the patient very generously and heroically contributed a certain amount of their own skin to cover the extensive area which had been destroyed by burn or injury. I must personally confess that for a number of years I was under the impression that grafts taken from other individuals were quite as apt to live as those taken from the patient himself, and I was confirmed in this by some rather striking examples which I had in my own work. I remember, for instance, some of the early skin-grafting which I did when I was in the United States Marine Service in about 1885—one case in particular where I grafted some skin from a white man and applied it on a leg injury in a negro, where I was satisfied that the small islands of integument remained permanently. That particular case I think was simply the exception that proves the rule, because in recent years we have had exactly the same experience as the surgeons have had who have previously handled this little patient, and I can now call to mind a number of cases, especially children, where we have grafted from mother and father and sisters and brothers, and have at the end of a week been greatly gratified to see how well the grafts were taking, and then found, to our dismay, at the end of twelve or fourteen days that the grafts had melted down and that we had accomplished little or nothing. I would like, therefore, particularly to emphasize the importance of removing the grafts from the individual himself. In the light of our present-day knowledge the only possible excuse for employing grafts from some other persons would be where, because of the extent of the injury or the bad condition of the patient, it was impossible to secure enough skin from the patient himself. In this connection I want to say that, as a rule, removal of the grafts from the patient is not a very serious matter, and that inasmuch as we take but half the thickness of the skin it is seldom a serious injury or menace to the individual, and it is so important to use autogenous grafts that the minor injury of removing skin from the patient seldom weighs anything against their employment.

Now, in the second place, I want to bring out quite fully the importance of sterilizing the field upon which we are going to plant the grafts. This should be done by a very thorough cureting of the entire granulating surface, removing all the granulation tissue, and with this we remove at the same time enormous numbers of bacteria which are on this granulating surface, and mechanically and efficiently sterilize this surface. You know that one of the most interesting new things that has developed during this present war in connection with surgery is the importance of this sort of mechanical sterilization—dissecting out of the wound as it is called. Huge irregular shell wounds of the thigh if seen within the period of contamination, let us say within six or eight hours, handled by dissecting out a thin layer of the entire surface of this wound, removing in this way mechanically the germs that have been forced into the tissues, permits in a very large percentage of the cases an immediate closure without drainage and secures primary wound healing.

The sterilization of the field upon which we are to place the grafts should be accompanied not only by this mechanical cureting but also by cleansing the integument for a wide area around the granulating surface with tincture of green soap and alcohol.

We have now placed the patient under ether anesthesia and, as you see, with this very large sharp spoon I am very rapidly cureting off the entire granulating surface, including also the edges of the integument around the granulating surface. You will notice that I have my assistant, as I remove the large area, press flat sponges over the bleeding surface to prevent any large amount of hemorrhage. These sponges are dry and held in there by the flat of the hand, and I am asking both of my assistants to rapidly follow me with this sponge pressure as I remove all the granulating tissue. I had this entire field of operation very thoroughly prepared, as already suggested, with tincture of green soap and alcohol. The oozing here is pretty marked and the amount of blood lost would be very great if it were not for this sponge pressure. It will be necessary for me to get a perfectly dry surface, entirely free from blood, before we apply the grafts. At a few points you see I put on artery forceps to control a fair-sized vessel that is bleeding freely. It requires, as a rule, six to eight minutes for the blood to coagulate in the small vessels on this raw surface, and, as you notice, if we should take this time by the watch, six or eight minutes seems like a very long period in an operation while we are waiting (Fig. 232, *a*).

Both thighs of this child have been previously very thoroughly prepared by shaving and cleansing them with tincture of green soap and alcohol. I shall begin now at the upper right-hand

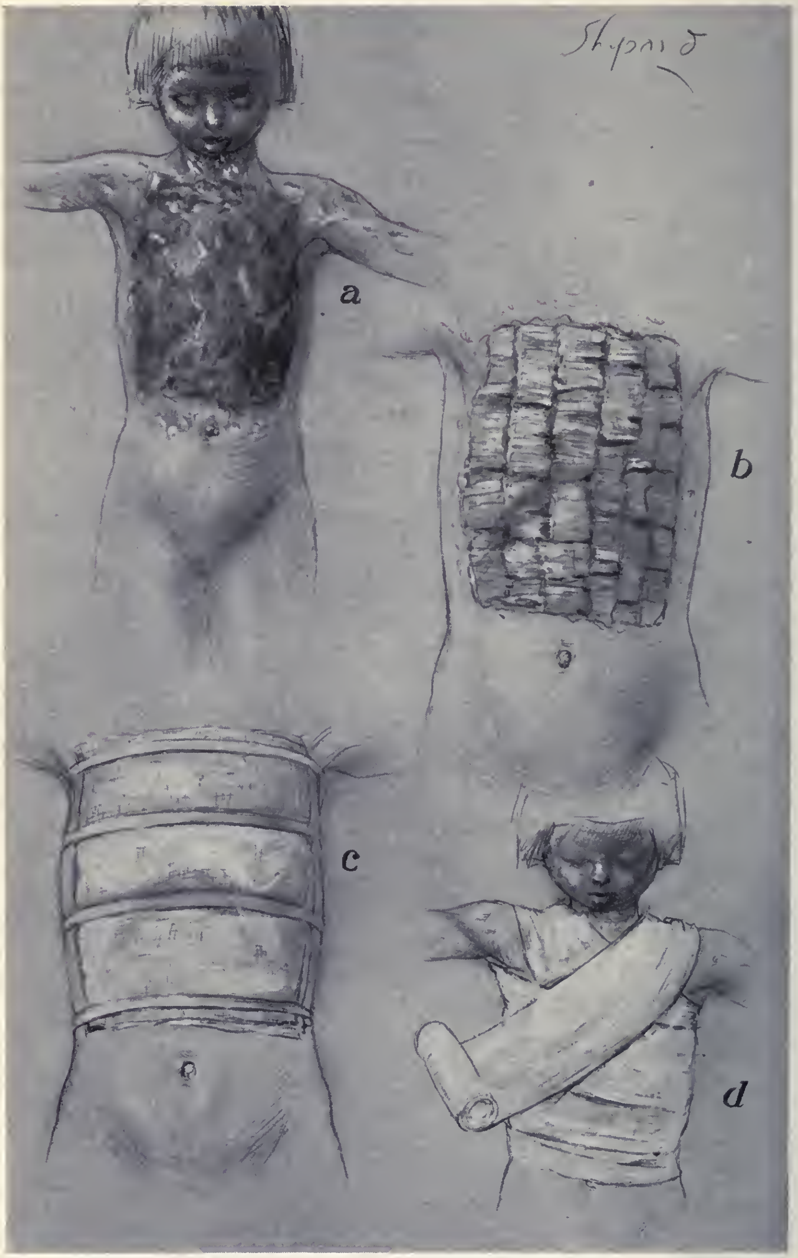

Fig. 232.

corner of this large area and find that I can uncover about one-fourth of this surface that does not bleed at all. I shall begin now with my skin-grafts, taking these two razors that have been specially sharpened this morning for this case. You will notice that one side is ground perfectly flat. My two assistants will help me make tense the integument on the outer side of the thigh. Beginning at the great trochanter I now remove strips of integument about 1½ to 2 inches wide and 3 or 4 inches long. With some ordinary cambric needles fixed in artery forceps my assistant helps me fix the two corners of the graft on the raw surface and, gradually withdrawing the razor, I am able to flatten the graft out perfectly. I want to emphasize the importance of pressing out any air. You will see that under this graft there are a number of air bubbles and with a flat needle I run over the graft as I press the air out from beneath. This is very important, because the air would, of course, prevent immediate occluding of the graft to the surface. In making the graft you see that I ask my nurse to hand me the razor wet with normal salt solution, and you will notice that, in addition to making tension by my assistant, I myself make the graft with a sawing motion and am particularly careful to see the edge of the razor as it splits the skin, so as not to cut too deep and remove at any point the entire thickness of the skin down to the superficial fat.

I am afraid that grafting this enormous area will be rather tedious for you, as it will take probably the greater part of an hour to cover this extensive area. One must not get impatient and one must be very careful after applying the graft not to displace it in the application of the next graft. I am personally thoroughly convinced that the first adhesion of the graft to the raw surface accurately and firmly is of great importance, and that grafts that are pushed around and separated from the surface after first being applied are not as apt to take. I cover about

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Fig. 232.—*a*. Extent of area to be grafted. *b*. Operation completed. The entire area has been covered by Thiersch grafts, great care being taken to see that each is snugly applied to the underlying raw surface. *c*. The grafted area is covered with several layers of gauze, which are held in place by adhesive plaster. *d*. Application of sterile roller to aid in the protection and fixation of the dressings.

one-half of this with skin taken from the right thigh and the other half taken from the left thigh, so that you see we have removed most of the integument from the anterior and outer aspects of both thighs.

Now we have covered every bit of this area (Fig. 232, *b*). The next step is the proper dressing for the grafts. I take two thicknesses of dry gauze a little larger than the entire area operated upon and very carefully, without displacing any grafts, I flatten this gauze out over the grafts. I now take a narrow piece of adhesive plaster and apply it to the upper border of this gauze above the raw area and then one below and two over the center part of the wound (Fig. 232, *c*). You see that this adhesive plaster is separated from the skin-grafts by two thicknesses of gauze and that it extends for 3 or 4 inches on either side on normal integument. It is perfectly dry. Now over this dry dressing I take a large, broad, soft roller of sterile gauze. You see it is about 8 or 10 inches wide. I put several turns of this roller over the chest and abdomen, bringing it up also over the shoulders like a pair of suspenders (Fig. 232, *d*). Now over this I place a starch bandage about 8 inches wide, applying it in the same way as the roller. As this dries we have a very firm dressing which is not apt to become displaced. We shall dress both thighs from which the grafts have been taken with sterile oxid of zinc ointment, a thin layer of which is placed on sterile gauze and the entire surface covered. Thin soft roller bandages are placed over these and a spica over the pelvis, and then over this again we place some starch bandages which give us perfect security from any displacement of the dressings.

As far as the after-management is concerned, I will say that if there is no evidence of discharge through the dressings we shall leave these dressings undisturbed for a period of ten days. At the end of that time they should be removed with the greatest possible care, and if the first two layers of gauze are attached at any point and do not come away easily on account of some scab, that particular adherent piece of gauze is cut around and left in position so as not to pull off the scab or run the risk of pulling off part of the skin-graft.

Our conception of the after-management is that it is exceedingly important to allow the evaporation of any discharge that may occur under the dressing, and that the amount of dressing should be very small and should be of a character to permit of free evaporation. It is important, for instance, not to cover the chest of this child with too many bedclothes, permitting of sweating. If there is any evidence of discharge, an attempt should be made with an electric fan playing upon this area to dry out the discharge.

Postscript.—It was gratifying to watch the after-course of this case. The temperature went steadily down from 101° and 102° F., as it had been before the operation, until at the end of the sixth day it remained normal all day long. The child was very comfortable, more comfortable than she had been for months. The thighs distressed her a little for the first few days and then the discomfort disappeared entirely. At the end of the sixth day the dressings were cut off and we could see several inches of the grafted surface which had healed in perfectly. At the end of ten days the entire area was covered in, permitting of the removal of almost all the dressings except at a few points where it had become adherent to the narrow scabs that had formed between the skin-grafts. The patient went on to a very rapid and very complete recovery.

SARCOMA OF LOWER JAW

Summary: Technic of excision of the lower jaw for malignant disease; importance of preliminary ligation of external carotid artery; block dissection of lymphatics and submaxillary glands.

May 6, 1918.

The second case that I want to show you this morning is also a piece of head surgery—a case of sarcoma of the lower jaw on the right side. The process seems to be pretty definitely limited, so that we can make a radical operation with a fair prospect of a permanent cure. I want to dwell particularly upon the technic which we shall employ in removing this lower jaw and the glands of that part of the mouth on the right side.

Under ether anesthesia I shall first ligate the external carotid artery. I make an incision in front of the sternocleidomastoid, beginning a little below the thyroid cartilage and going upward to a point about opposite the hyoid bone. As you see, I am joining this with a curved incision under the lower jaw, extending from just below the ear to a point about opposite the middle of the chin (Fig. 233, 1 and 2). This enables me to expose, after we divide the skin and superficial fascia and platysma and deep fascia, the sheath of the great vessels. I find that the common carotid divides at the usual point of division about opposite the upper border of the thyroid cartilage. I follow out the external carotid artery and find very shortly after it is given off it gives off a very large superior thyroid artery, which passes downward and inward. I do not care to have this involved in the ligation, so I ligate the external carotid just beyond the superior thyroid, which will cut off the blood-supply of the area involved in the subsequent steps of the operation. I am very fond of doing this preliminary ligation in these cases and regard it as an important step in the procedure, both because it makes the operation easier and because I believe that it has a tendency to slough out the malignant growth and improve the prospect of at least a long palliation, if it does not add anything definite to the prospect of cure.

I now extend the anterior part of my incision and split the middle of the lip, clamping the two sides first with artery forceps so as to control any bleeding. I divide the soft tissues from the jaw well beyond the area of the tumor. With a pair of dental forceps I now extract the right central incisor tooth and divide the symphysis with a wire saw (Fig. 234, 3 and 4). I make a free block incision and remove all the lymphatics in the floor of

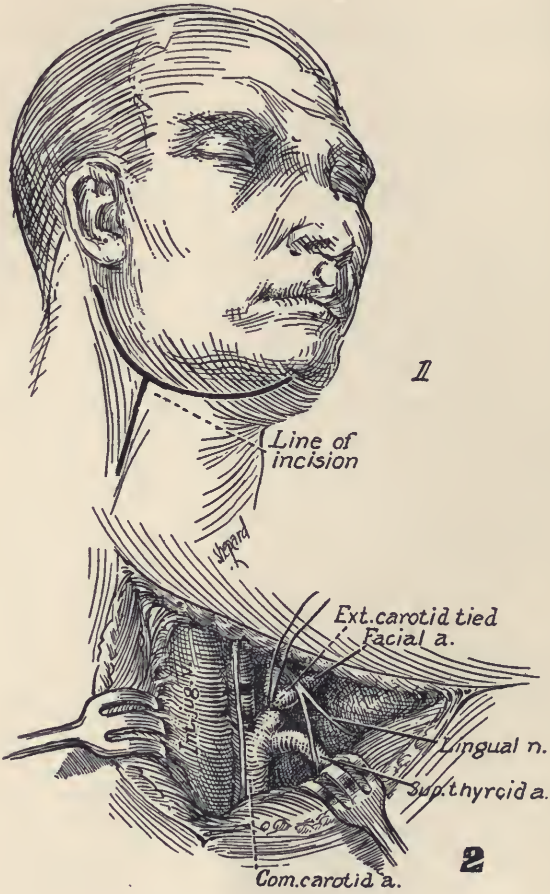


Fig. 233.—1 and 2. Incision for ligation of external carotid artery and exposure of tissues to be removed.

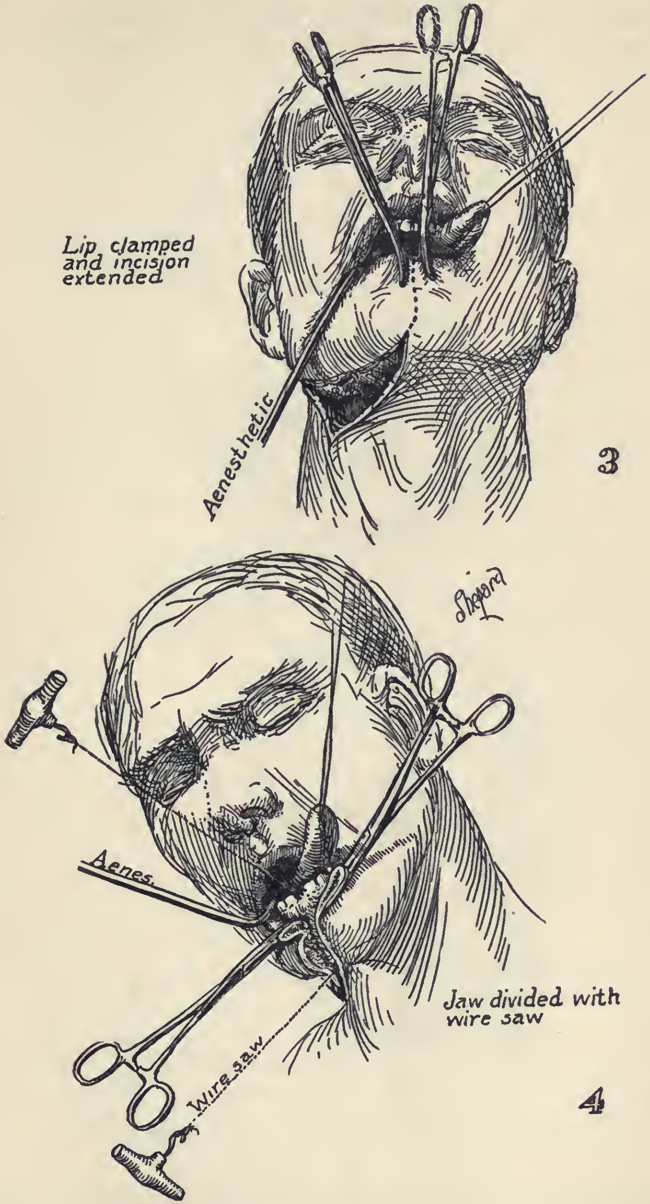
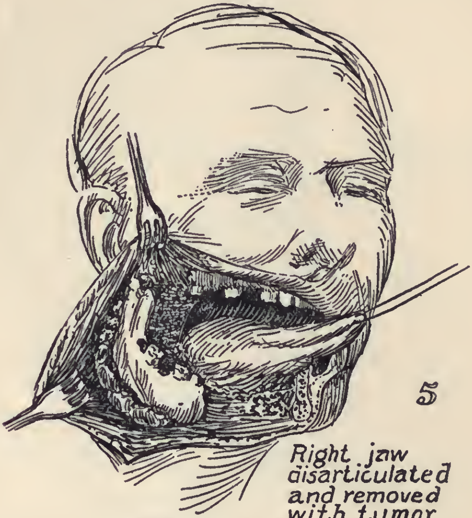


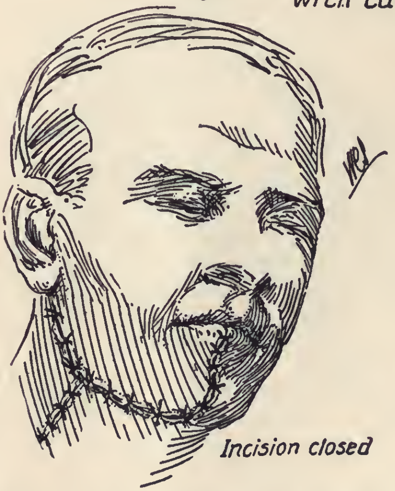
Fig. 234.—3 and 4. The sound tissues have been separated from the jaw, which was then divided in the midline by means of a wire saw and removed.

the mouth and the submaxillary salivary gland with the lower jaw and the tumor. Extending my dissection up to the coronoid process, I cut off the insertion of the temporal muscle with a heavy pair of scissors. Coming to the articulation of the lower jaw, I twist this out, using considerable force so as to dislocate it



5

Right jaw disarticulated and removed with tumor



6

Incision closed

Fig. 235.—5 and 6. Steps in the closure of the wound.

and then divide the attachments of the pterygoid muscles and general capsular ligaments with strong scissors.

You will notice that there is very little if any arterial spurting after the ligation of the external carotid. There is some slight venous hemorrhage, which is easily controlled with artery clamps. The large cavity from which the tumor has been removed is now packed lightly with iodoform gauze and the external incision closed (Fig. 235, 5 and 6).

After-history.—The patient made a good operative recovery and experienced a great deal of relief from the pain which he had had before operation. Histologic section showed a mixed-cell sarcoma, small round cells and giant cells, giving a fair prognosis. I believe that the use of either radium or *x*-ray will add something to the prospect of cure in this case, and would advise that these treatments be carried out.

CARCINOMA OF THE LARYNX—TECHNIC OF OPERATION UNDER INFILTRATION WITH APOTHESIN

Summary: A patient who was operated on three months previously for adenocarcinoma of the bowel returns with proved squamous-cell carcinoma of the larynx; exposure of laryngeal tumor under local anesthesia and removal by cautery; after-treatment—importance of leaving vent in incision for the escape of mucus and blood and for the introduction of a tracheotomy tube should occasion require; two methods of feeding the patient.

May 17, 1918.

THE case that I shall present to you this morning is one upon which I recently operated. About three months ago I resected about 6 inches of the ileum, cecum, ascending colon, and part of the transverse colon in this patient for a carcinoma beginning in the ascending colon several inches above the cecum. The operation was done under local anesthesia because of the fact that he had a lesion of the larynx which interfered very greatly with his breathing. At that time the exact pathology of the larynx lesion had not been determined by microscopic section, and the carcinoma of the bowel was beginning to produce obstructive symptoms which demanded immediate relief. He made an unusually rapid and complete recovery from his bowel resection. Before leaving the hospital I urged him to have a section removed from the lesion in the larynx, so that we could determine its exact pathology and do whatever was necessary at that time. He refused to do this, but later returned to the city and went to Dr. George E. Shambaugh, who removed a piece of tissue from the larynx by the intralaryngeal route.

This was submitted to microscopic analysis and, although Dr. Shambaugh was inclined, from the appearance of the lesion as revealed by the laryngoscope, to believe that it was not a carcinoma, the histologic examination showed a definite squamous-celled carcinoma. The lesion is still intrinsic, that is, limited to the structures inside of the larynx. There is no evidence whatever of lymphatic involvement or of any involvement outside of the cartilaginous larynx.

I shall operate this morning under local anesthesia and shall use apothesin ($\frac{1}{2}$ per cent. solution) with adrenalin (1 : 100,000).

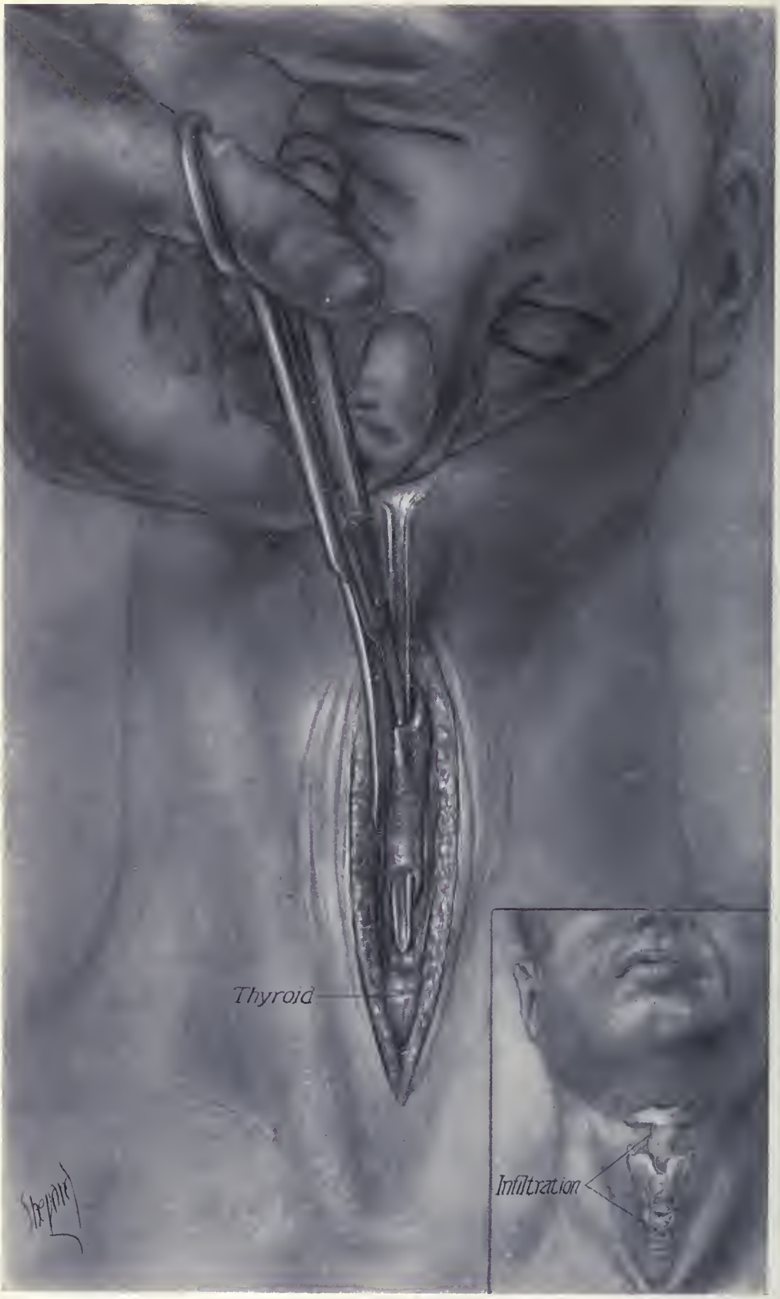


Fig. 236.

I have preceded the local anesthetic with $\frac{1}{4}$ grain of morphin and $\frac{1}{150}$ grain of atropin. Placing the patient in a comfortable position, so as to bring the larynx well forward and accessible, I infiltrate in the median line from the hyoid bone down to the sternum (Fig. 236, insert), beginning with a very fine needle, such as we use for morphin injections, infiltrating a small area with the small syringe and needle, and then changing to a larger needle and syringe, using about $1\frac{1}{2}$ to 2 ounces of apothesin solution. This makes the area infiltrated perfectly insensitive within a few minutes. I begin at once the incision, extending from the hyoid bone down almost to the sternum, and divide the skin and superficial fascia and the layer of deep fascia which furnishes the sheath of the sternohyoid and sternothyroid muscles and the thyroid cartilage. Coming down to the thyroid cartilage I expose the soft tissues just above the thyroid for a distance of $\frac{3}{4}$ inch. I expose also the cricothyroid membrane and the cricoid cartilage. I have the anterior sharp edge of the larynx now fully exposed. I try to divide this with a knife, but find it ossified and that it is impossible for me to do this. I therefore take a grooved director and, beginning at the upper angle, run the grooved director behind the cartilage between it and the mucous membrane of the larynx, and taking a heavy, powerful pair of scissors, guiding with the grooved director, I run one blade of the scissors down behind the ossified cartilage and divide the entire length with one stroke of the scissors (Fig. 236). I then take two sharp retractors and, placing them one on either side of the divided cartilage, pull the larynx wide apart. The air rushes in, as you see, as I open the larynx, and there is a little irritation from the blood that trickles into the larynx and trachea. I shall take some 1 per cent. solution of cocain on cotton pledgets and cocainize the mucous membrane of the larynx and trachea, so as to prevent any coughing and irritation. At this stage of the operation I have had the head of the table lowered and the foot elevated slightly, so that any

Fig. 236.—Insert: Infiltration of tissues for primary incision. Main figure: Larynx partially exposed. A grooved director has been passed, submucous, back of the angle of the thyroid cartilage to serve as a guide for the blade of the scissors with which the cartilage is cut.

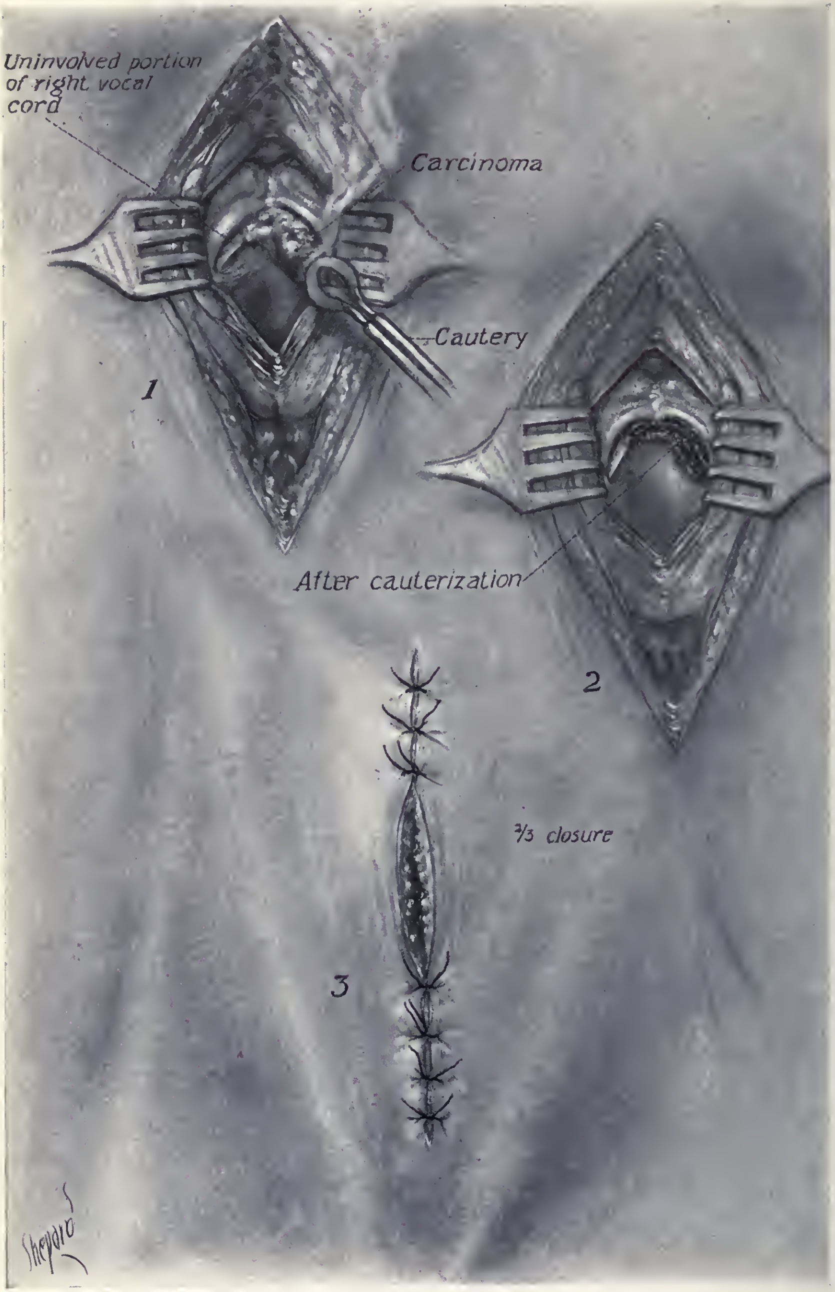

Uninvolved portion of right vocal cord
Carcinoma
Cautery
1
After cauterization
2
⅔ closure
3
Shepard

Fig. 237.

blood that may get into the larynx and trachea will run down into the mouth and not into the trachea and bronchi.

Spreading the larynx open widely I can now see the lesion, which is a flat epithelioma of the left vocal cord, extending for a short distance into the right cord. The lesion is quite limited, and it is evident that we can remove thoroughly the entire malignant process without sacrificing the larynx. I shall do this with the electric cautery, using a small electric hand light which illuminates the interior of the larynx very nicely (Fig. 237, 1). I destroy all of the left vocal cord and the entire lesion and about one-half of the right vocal cord. I do this rather slowly, using a cautery heated to a brown color and not to a bright red color. It is very important to do this, because a very hot cautery will destroy the tissues so rapidly as to produce hemorrhage, while a cautery heated to a brown heat will cook the tissues and, if properly used, destroy the lesion quite as effectively without producing any bleeding (Fig. 237, 2).

The patient has stood the operation remarkably well and has shown little evidence of distress or anxiety. How shall we handle the operative wound? Shall we make an immediate closure and trust to his ability to breathe through the normal passage, or shall we use a tracheotomy tube? I think that neither plan is desirable. I shall simply close this 4-inch incision in part and leave open that part of the skin incision which is directly opposite the divided thyroid cartilage and cricothyroid membrane (Fig. 237, 3). This will make it easily possible for us to introduce a tracheotomy tube if one is required in the further management of the case. It will give an additional advantage of expelling a good deal of mucus and some blood directly through this opening. We have found by previous experience that this is the preferable plan of procedure. We shall allow the patient to sit up on a back rest. I shall protect the wound with two or three

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Fig. 237.—1. Larynx opened, exposing tumor for removal with electric cautery. 2. Removal of tumor completed. 3. Skin incision left open opposite incision in larynx to serve as a path for drainage and to facilitate the emergency introduction of a tracheotomy tube.

layers of gauze, which will be changed frequently by the nurse as they become saturated with mucus and wound secretion.

The after-management of these cases is particularly important, and I shall give you the details which we have found to be of value. First, the patient should be given normal salt by rectum, about 8 or 10 ounces every three or four hours for the first twenty-four or forty-eight hours. It will be difficult for him to swallow. The morning after the operation, if the patient cannot swallow, one of two plans may be adopted: The patient may roll over on his right side in bed with his head hanging over the bed a little lower than his body, and in this position it will be found possible, as a rule, for him to swallow water, milk, and broth. If, however, it is difficult for the patient to do this, a No. 12 or 14 catheter is carefully introduced into the mouth and into the esophagus and down the esophagus for a distance of 8 or 10 inches, and fluids, milk, water, gruels, and cocoa are administered in this way until he regains control of the epiglottis. The few stitches that we have employed in the upper third and lower third of the wound should be removed early, on the third or fourth day, to prevent cutting of the tissues. At the end of about eight or ten days, when the wound looks normal and is covered with healthy granulations, if the patient breathes perfectly well through the normal passages the small open central portion of the wound should be closed by adhesive strips, or at least brought together so as to make wound healing by secondary intention the more rapid.

Postscript.—This patient made a very satisfactory, uninterrupted recovery. The stitches were removed at the end of the fourth day. He developed no evidence of any lung complications. It was difficult for him to swallow except in the hanging-head position. This way he managed fairly well.

This patient's case interests us because he has developed two primary carcinomas at different points of the body, one an adenocarcinoma of the bowel and the other an epithelioma of the larynx, evidently quite independent of each other. Of course, it is also interesting from the fact that both of these conditions have been operated upon under local anesthesia with very great satisfaction both to the surgeon and to the patient.

CLINIC OF DR. CARL BECK

North Chicago Hospital

PARTIAL RHINOPLASTY—TRANSPLANTATION OF SKIN FOR REPAIR OF DEFECT ON TIP OF NOSE BY THE ITALIAN METHOD

The restoration of a part of the nose for cosmetic purposes is sometimes difficult. A great deal depends on the healing process.

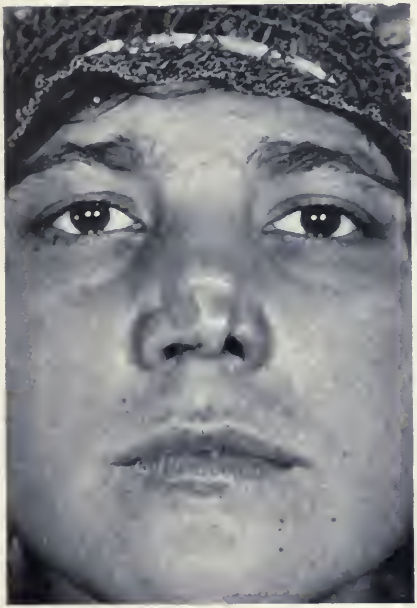

Fig. 238.

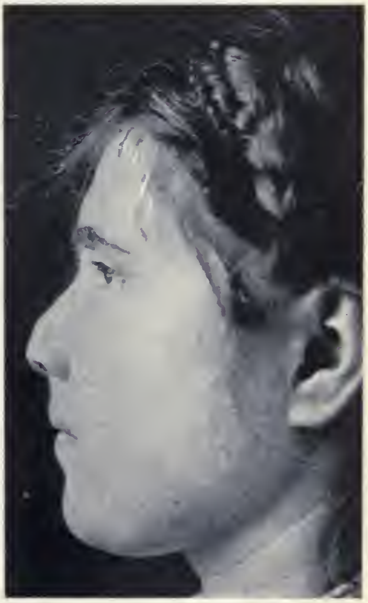

Fig. 239.

Fig. 238.—The wide scar, contracted, and exposing the cartilage. One notices that in the upper part of the scar the healthy skin passes in a sort of step into the exposed cartilage, which is covered by scar. The left nostril wide and the right nostril narrow, most of the contraction in the corner of the left nostril. Fig. 239.—Side view of the patient before the operation. Shows the abruptly descending scar of the nose, cutting off the tip.

The following case is illustrative of the good results in a case of restoration of the tip of the nose.

This young woman, twenty-one years of age, had the misfortune of having her nose bitten off by her husband in a fit of jealousy. The teeth cut into the anterior portion of the nose, so that the projecting top was torn off and the cartilage was badly lacerated. The nose retained its shape to a certain degree, but only in its cartilaginous portion. After healing by suppuration there remained a very unsightly scar, because it presented the cartilage covered by a shining white surface (Figs. 238 and 239).

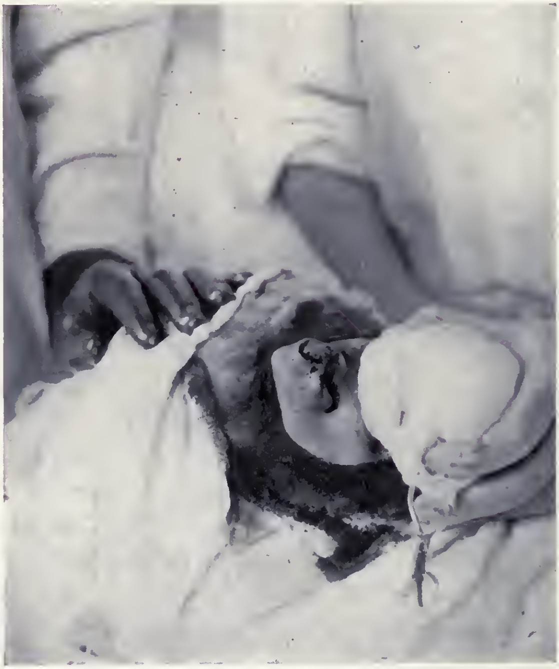

Fig. 240.—Patient during operation. The scar is resected from the nose by sharp incisions, and one sees now the defect produced by this preliminary step. One can see the broad border of the skin of the nose distinctly.

The patient urgently wished restoration. Her cheeks and the rest of her nose were in excellent condition, free from every scar, and of very fair skin. The decision had to be made whether this tip should be restored from the neighborhood by a pedicled flap transplantation or from a distance by the Italian method. The face of a woman in plastic operations should be disfigured as little as possible. In a man, especially one who grows a beard, it is easier to avoid a scar; the skin does not show the scar so badly. A flap operation from the forehead would have left considerable scar on the same. The same scar formation would be visible in the transplantation from the cheek. With the best possible results, we could not have avoided scars on the cheek, with perhaps some deformity. It was deemed best, therefore, to employ the Italian method of transplantation, using a flap from the forearm, under general anesthesia; in a typical manner a flap of skin was cut from the inner surface of the left forearm, the nasal defect was freshened on by exact dissection

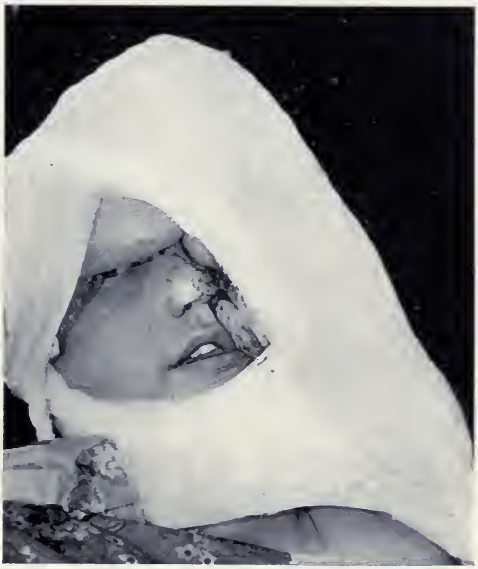

Fig. 241.—Patient's arm is connected with the face and held in apposition by a plaster cast, which is made so that it allows absolutely the freedom of the nose to the mouth. There is no dressing in the wound of the nose. One can see the flap distinctly attached to the defect. There is some padding between the cheek and the arm and some cover over the left eye, because the perspiration and the bloody discharge is liable to cause eczema if not protected.

of the scar, making sharp and clean borders where the teeth of the miscreant had produced regular indentations. A defect of a more or less rectangular shape was the result (Fig. 240). This sharp border was united exactly with as few sutures as possible to the flap of the forearm on three sides, and for ten days the arm was left in apposition, so that the flap of the arm could heal into the nasal defect (Fig. 241). After ten days the flap from the forearm was separated in its pedicle on the fourth side (Fig. 242).

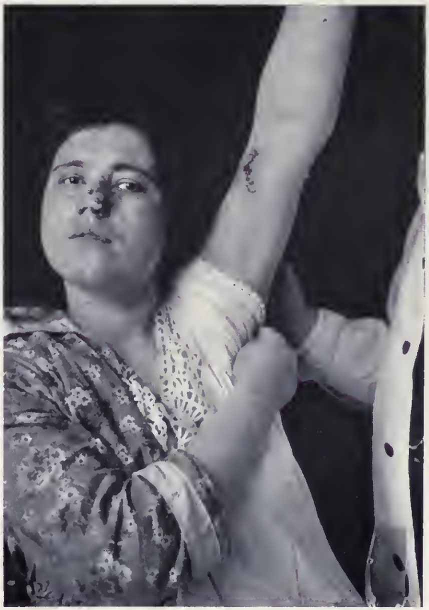

Fig. 242.—The flap from the arm has been separated and left in contact with the nose; the fourth side of the flap, which has not been detached, is seen projecting. The defect of the arm produced by the flap is sutured, so as to leave as little scar as possible.

It had healed on beautifully to the nose (Figs. 243 and 244), and now it was shaped and united to the fourth side of the defect, which corresponds to the left side of the tip of the nose (Fig. 245). Unfortunately, all this cannot be done in one sitting. It takes a few days always to reduce the size of the swollen pedicle, inasmuch as the tissues change in size and color as the healing takes place.

One has to know a great deal about these changes in order not to make the mistake of making such a flap too large or too small. During the process of wound healing the borders of the skin are somewhat swollen and irregular; after a few weeks scars thin out, become paler and often retract, thus creating grooves where projections were before. All this has a great bearing upon the ultimate plastic result.

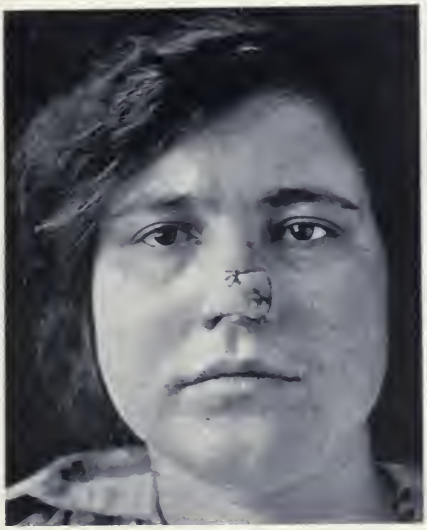

Fig. 243.

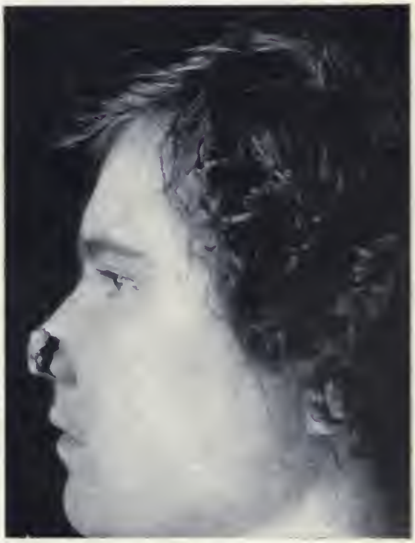

Fig. 244.

Fig. 243.—Front view of the flap which has been inserted and is still not adapted in its fourth side. One stitch holds it yet at the place where it is liable to separate, but alongside the right incision and on the septum it has healed in beautifully.

Fig. 244.—Side view of the nose in this state shows the thickness of the flap, with the underlying submucous tissue, which is allowed to shrivel up for a few days before it is ultimately united into the fourth side of the defect, namely, the left side. This is necessary so as to get the utmost shrinkage of the flap before adapting it.

At the end of about three weeks the flap has now firmly united, joined on all sides, and forms a nice tip of the nose, of the same color and appearance as the rest of the skin. This, however, does not finish the whole plastic for cosmetic purposes. Small corrective operations have to be done in order to make the nasal transplant fit in shape and color exactly, and excision of small portions of scars, leveling of protuberances has to be done until finally an ideal result is obtained (Fig. 246).

These conditions, however, are a matter of weeks. The elimination of scars in particular is one process which in these very delicate, cosmetic operations is of great importance, and requires a very fine, delicate technic. Inasmuch as many individuals have a tendency to develop scars of much larger size than others, one has to know how to deal with these excisions of scar tissue to prevent the formation of keloid or exuberant scars.

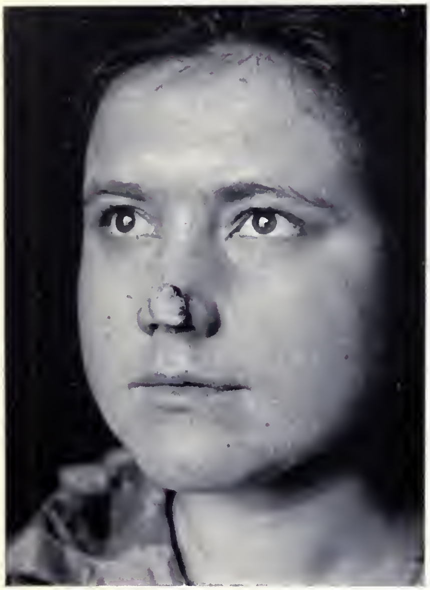

Fig. 245.

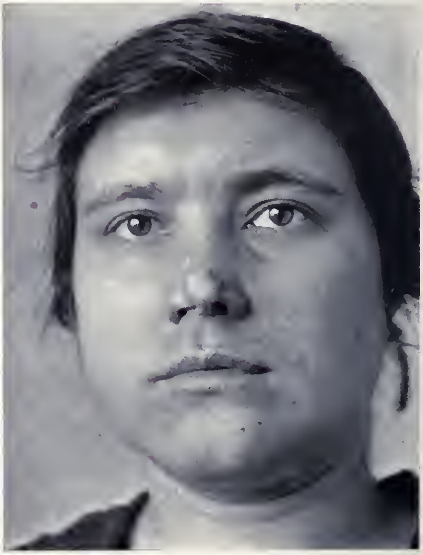

Fig. 246.

Fig. 245.—The result of the plastic immediately after adaptation of the fourth side to the defect. It is one of the most difficult problems to make this adaptation exact and so that it should leave very few scars.

Fig. 246.—The result of the plastic eight weeks after the operation. There is some visibility of scar, but in the course of six to eight weeks this slight visibility will disappear entirely. The right side already shows very little difference between transplant and original skin.

TREATMENT OF PHLEGMON OF HANDS AND FINGERS

Summary: Two cases illustrating the supreme importance of wide incision with perfect exposure of infected tissue in the management of hand infections.

THERE is still a wide difference of opinion among surgeons as to what is the best treatment of phlegmonous infection of fingers and hand. I am going to illustrate a treatment, which I consider most appropriate, on two typical cases. The first is that of a phlegmon of the thumb in a lady forty-five years of age, who stuck her thumb with a darning needle and infected it. There was only a point-like entrance wound at the time of the injury, but very soon there developed typical symptoms of infection of a punctured wound, namely, swelling, a great deal of tenderness, heat, edema of the thumb, extending into the palm of the hand. The physician who was called in the first place made under local anesthesia (which probably was not a full anesthesia, as the patient complained of a great deal of pain during the operation) a deep but very small incision in the neighborhood of the first joint, with the result that some pus escaped, but not much relief was given to the patient. On the contrary, a few days after this incision the patient, who had a small goiter, rapidly developed exophthalmus, palpitation of the heart, and considerable increase in the size of the thyroid gland.

When I first saw her she had a typical swelling of a phlegmonous thumb, the edema was not very extensive over her palmar surface, but the symptoms of exophthalmic goiter quite pronounced; patient extremely nervous, with rapid heart-beat. Constant perspiration and diarrhea were added to the symptoms of infection, consisting of fever and local changes in the thumb.

An anesthetic was necessary, but it was a morphin-scopolamin injection, with very little ether, and the whole thumb in its volar surface was split over both phalanges. It was found that the tendon was necrotic at the bottom and the fatty subcutaneous cell tissue of the thumb was partly replaced by the yellow necrotic tissue of the phlegmonous infection. Everything was cleaned away which seemed pathologic, the wound left in clean condition, packed, and dressed (Fig. 247).

Immediately fever and local symptoms disappeared; within a week the symptoms of exophthalmic goiter almost subsided, the goiter grew smaller, the pulse became normal, the patient slept again.

The after-treatment consisted in a local bath for about two weeks until the wound had become absolutely clean and filled with redundant red granulations (Fig. 248), whereupon secondary suture was applied and the borders of the wound adapted again. It healed by secondary union rapidly (Fig. 249).

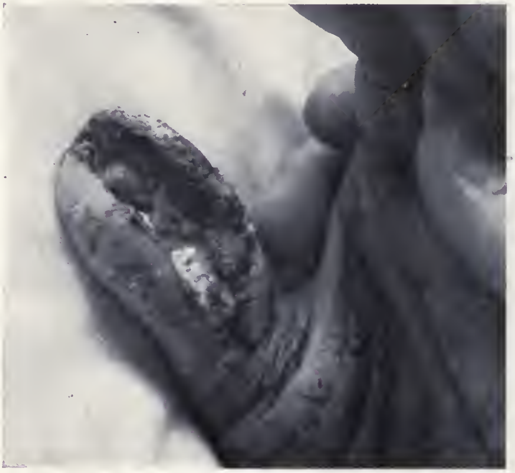

Fig. 247.—Thumb split from the nail down to the second phalanx.

Within four weeks the patient had no symptoms of exophthalmic goiter and an almost normal thumb.

The second case is one in which the patient injured his index-finger with a screwdriver and cut it deeply. He developed immediately afterward a swelling of the finger, palm, and dorsum of his right hand, a phlegmon of his hand, and lymphangitis with swelling extending clear into the axillary region.

When he came to me he already had two incisions in his finger, under local anesthesia, small and deep; both had yielded some pus. Out of these incisions were protruding unhealthy granulations, edematous and red, very sensitive, and pus escaping. In the dorsal region there seemed to be some deep indistinct fluctuation. The patient had a temperature.

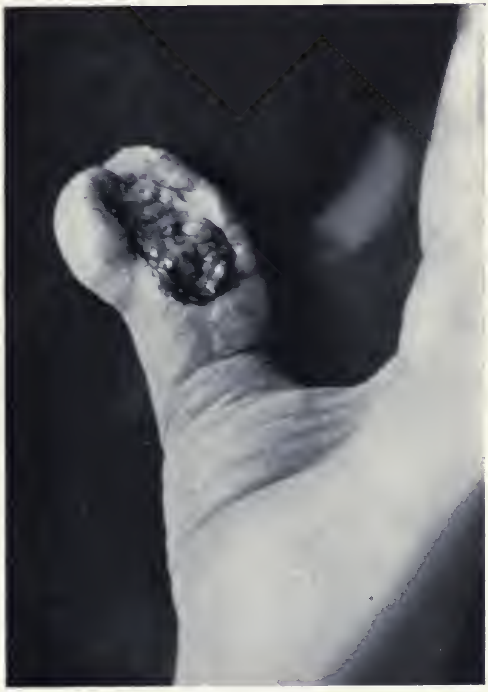

Fig. 248.—The granulation protruding and the two divisions of the thumb gradually closing one upon the other by granulations.

The first thing we did was the application of moist dressings to his arm with Billroth's solution. This very soon reduced the inflammatory condition of lymphangitis and adenitis. Whereupon, under general anesthesia, his hand was opened by an incision extending from the tip of his right index-finger on the inside of the hand clear down to the median line of the wrist

(Fig. 250). In this incision the sheaths of both tendons of the index-finger were found surrounded and filled with thick yellow pus. The pocket extended into the dorsal surface. Nothing else was done but this cavity packed and the patient brought to bed after his operation. The dressings were changed on the fourth day. Unfortunately, the tendons were dead and sloughed out very shortly, leaving healthy granulations extending through the whole incision, but some fibers of the paratendinous tissue remained alive.

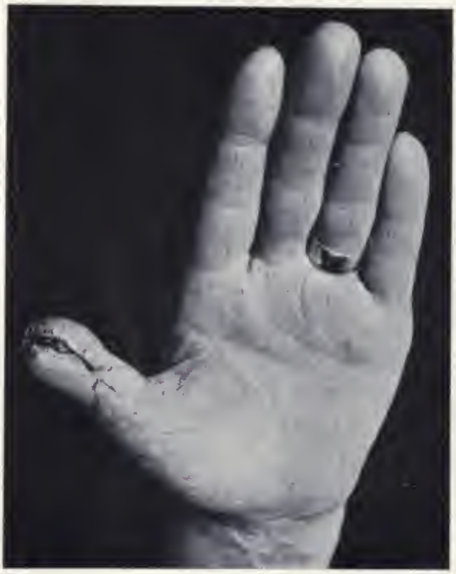

Fig. 249.—The end-result with secondary union produced by adhesive plaster adaptation.

Within three weeks after the injury the last traces of the dead tendons sloughed off and the hand was treated during this whole time by simply removing the packing and dressing over the wound. As soon as the granulations were perfectly clean, with no more foreign body or necrotic tendon present, a secondary suture united the wound and restored the shape of the hand (Fig. 251).

Even at this time flexion of the finger within the joint of the third phalanx and metacarpus is possible, evidently due to the remnants of some fibers of the flexor tendon.

But the question will arise whether it is worth while to undertake a plastic of the flexor tendon so as to allow full folding of the index-finger. It seems to me that that will not be possible, although it may be tried.

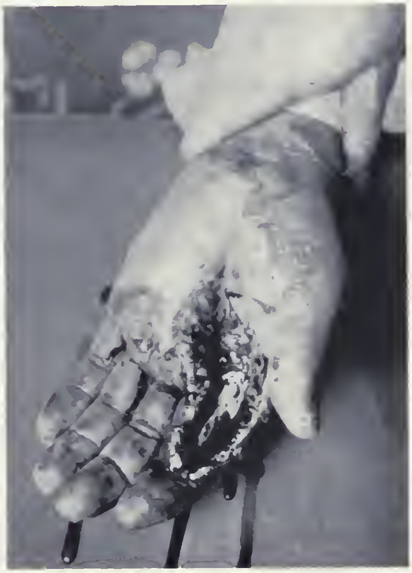

Fig. 250.—Incision of the phlegmonous hand into the middle of the hollow of the hand. Shows also the necrotic tendon in the center (the tendon is white) at the time of the first operation.

These two cases illustrate how phlegmonous affections of fingers and hands ought to be treated, namely, wide opening of the infected area along side anatomic channels, giving a chance to all infected areas to discharge their dead and half-dead tissue outward without much tension, and then to restore by secondary suture normal contours of the hand. Undertake no plastic work until the hand has become perfectly normal, perhaps a year or two years after this severe pathologic condition has healed out.

Until then plastic operation will not be successful; but when

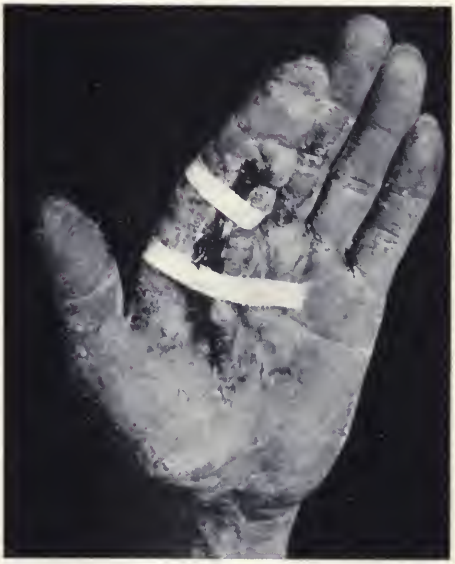

Fig. 251.—Method of adaptation after all the septic infectious process has yielded to granulation. The ultimate result is perfect healing with possibly some stiffness in the movement of the index-finger, which gradually, however allows some flexion.

normal conditions have returned, tendoplasty may be tried with some prospect of success.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

THE ACUTE ABDOMEN—A CLINICAL LECTURE

Summary: A patient presenting symptoms of an acute abdominal condition complicated by certain evidences of intrathoracic disease—differentiation of the acute abdomen from acute inflammations of the pleura. Detailed analysis of the signs and symptoms of acute abdominal affection.

This patient presents many of the symptoms of an acute abdominal condition, but the question has been raised whether we are not dealing with some acute thoracic lesion whose clinical picture simulates very closely that of an acute affection of one of the abdominal viscera. In other words, has this patient a pneumonia with referred abdominal rigidity and tenderness, or has he one of the numerous conditions which can give rise to the so-called "acute abdomen"?

What are the salient facts in his history? A man sixty-seven years of age, a tailor by occupation, has always enjoyed good health up to two weeks ago, when his present illness began with a cough and pain in the right side of the abdomen. The cough has been accompanied by the expectoration of a large amount of yellowish, mucopurulent sputum. He has never had any attacks of abdominal pain up to two weeks ago. His previous history, habits, etc., only reveal the existence of a chancre twenty years ago. The physical examination of his lungs and heart fails to show any changes which would account for the abdominal symptoms. Let me, however, call your attention to the great value of the examination of acute pulmonary lesions with the fluoroscope and by taking stereoscopic pictures of the chest. During the past winter it has been possible to diagnose areas of consolidation by these *x*-ray methods at many of the cantonment base hospitals before the physical signs showed a pneumonia or empyema.

I feel confident even without an *x*-ray examination that we can exclude a thoracic condition as the underlying cause of his acute abdominal symptoms even though his breathing is rapid and costal in type. One must, however, never overlook the possibility that a pneumonia or a pleurisy situated close to the diaphragm may give rise to such marked abdominal rigidity and tenderness as to completely simulate a true intraperitoneal lesion, and many patients have been laparotomized for a supposed acute appendicitis or acute gall-bladder infection when, in reality, the cause was located above the diaphragm.

The patient since his entrance to the hospital has appeared very ill, but his temperature remains about 101° F., and the highest white blood-count is 15,000, with 80 per cent. polymorphonuclears. The chief symptoms during the two weeks since the onset of his illness have been the cough and the right-sided abdominal pain. Let us now examine the abdomen. This reveals the following:

There is a soft irreducible umbilical hernia about the size of a walnut. The lower half of the abdomen is quite prominent and moves but little with respiration. There is no rigidity present anywhere except in the right upper quadrant, but there is tenderness over the entire right half, rendering it impossible to palpate satisfactorily. No areas of dulness can be found. Rectal examination does not reveal any bulging, as is often found when an appendiceal abscess lies in the true pelvis. In this connection let me urge you never to omit taking the rectal temperature in every acute abdominal case, and, again, never to fail to make a rectal examination in both sexes, especially children, and a bimanual vaginal examination whenever possible in the female.

Let us consider some of the many acute abdominal conditions which can give rise to symptoms such as this patient has, and see if we can arrive at a diagnosis by excluding the majority of them from further consideration.

In the differential diagnosis of the various conditions which appear under the clinical picture of the acute abdomen it is of advantage to have some definite plan of enumerating them so that even the less frequent ones are not omitted from consideration. I have found that if I begin with the viscera normally found in the upper abdomen and think of the acute lesions of these structures, and then proceed to recall those of the viscera of the lower portion of the abdomen, I can rapidly eliminate one condition after the other from consideration. The same is true of extra-abdominal causes which can also be enumerated from a regional standpoint, *e. g.*, nervous system, thorax, etc.

The conditions which the surgeon must consider in making the diagnosis of the cause of the acute abdominal symptoms in his patient are the following, enumerated, as I have just suggested, according to viscera and regions:

Acute abdominal affections:

1. Biliary passages, liver, and subphrenic space.
    - (*a*) Infections of the gall-bladder or bile-ducts, with or without calculi.
    - (*b*) Abscess of the liver (solitary or multiple).
    - (*c*) Subphrenic peritonitis (dry or suppurative).
2. Stomach and duodenum.
    - (*a*) Acute and subacute perforations of ulcers.
    - (*b*) Acute dilatation of the stomach.
3. Pancreas (acute and subacute hemorrhagic and suppurative pancreatitis).
4. Spleen.
    - (*a*) Acute perisplenitis.
    - (*b*) Splenic abscess.
    - (*c*) Torsion of movable spleen.
5. Omentum and mesentery (including vessels).
    - (*a*) Torsion of the omentum.
    - (*b*) Acute suppurative epiploitis.
    - (*c*) Thrombosis and embolism of the mesenteric vessels.
    - (*d*) Acute suppuration of the mesenteric lymph-nodes.
6. Small intestine.
    - (*a*) Acute Meckel's diverticulitis.
    - (*b*) Ileus of various forms (especially obstruction by bands, kinks, through apertures, or by intussusception).
    - (*c*) Gastro-enteritis.
    - (*d*) Lead-colic.
    - (*e*) Reflex ileus from various causes.

7. Large intestine (except cecum and appendix).
    - (*a*) Sigmoid diverticulitis.
    - (*b*) Various forms of ileus (especially volvulus).
    - (*c*) Inflamed rectal diverticulum.
    - (*d*) Enterocolitis.
8. Cecum and appendix.
    - (*a*) Primary typhlitis (non-malignant).
    - (*b*) Appendicitis (pyogenic, actinomycotic, and tuberculous).
    - (*c*) Carcinoma of appendix or cecum, with secondary infection.
    - (*d*) Acute infection of ileocecal lymph-nodes.
9. Peritoneum.
    - (*a*) Acute pyogenic peritonitis due to non-traumatic perforation of a hollow viscus or extension from internal genitalia of female.
    - (*b*) Pneumococcus peritonitis.
    - (*c*) Subacute tuberculous peritonitis usually secondary to tuberculous appendicitis.
10. Genito-urinary tract.
    - (*a*) Acute infections of kidney, perinephritic tissue, and ureter.
    - (*b*) Renal and ureteral calculi.
    - (*c*) Ditl's crises (kinking of ureter in movable kidney).
    - (*d*) Strictures of the ureter with infection.
    - (*e*) Tumors of the kidney (with fever).
    - (*f*) Acute inflammation of the intra-abdominal portion of the vas deferens.
11. Internal genitalia of female.
    - (*a*) Twisting of pedicle of ovarian cyst or pedunculated fibroid of uterus.
    - (*b*) Salpingitis, oöphoritis, etc.
    - (*c*) Extra-uterine pregnancy.

Extra-abdominal causes:

1. Thorax (pneumonia and pleurisy—especially diaphragmatic—with referred abdominal symptoms).

2. Nervous system.
   (*a*) Tumors of spinal cord or spinal column with referred pains.
   (*b*) Tabes with visceral crises, especially gastric and renal.
   (*c*) Hysteria.
3. Inflamed lymph-nodes along the iliac vessels (simulates acute appendicitis).

It will be impossible for us to discuss in detail all of these many affections which must be taken into consideration in the differential diagnosis of the acute abdomen, but we will take up briefly the more common ones.

1. Biliary passages, liver, and subphrenic space.

Under acute affections of the biliary passages we include the following:

a. Acute cholecystitis, with or without calculi in the gall-bladder or cystic duct, or both.
b. Acute choledochitis (acute inflammation in the common duct or main hepatic ducts), with or without calculi.
c. Acute cholangitis (intrahepatic).

a. *Acute cholecystitis, with or without calculi in the gall-bladder or cystic duct, or both.*

It was formerly thought that the mere passage of calculi could be the only cause of severe pain referable to the biliary tract, but we now know that the passage of such calculi is invariably accompanied by more or less inflammatory reaction, or is rather caused by this, and furthermore, it is a well-recognized fact that an acute or chronic infection within the lumen of the gall-bladder, or of the extrahepatic, or even of the finer intrahepatic bile-ducts can give rise to practically the same clinical picture as though calculi were present. It is, therefore, advisable both in regard to diagnosis and prognosis to be guarded in making the statement that calculi are or are not the cause of the acute symptoms in these structures. In other words, the clinical picture of a severe infection of the gall-bladder without calculi does not differ in any essential particular from that of a similar case in which a single large or a number of small calculi are present. The most striking symptom is severe pain referred to a point corresponding to the outer portion of the right rectus muscle close to the right costal arch. The typical radiation of pain (Fig. 252) is toward the right shoulder, but in a number of cases it has been observed to radiate to the left shoulder as well, and often one sees a patient whose principal direction of radiation of pain has been directly backward toward the spine. This pain is usually accompanied by rise of temperature to 103° F. or higher, by a marked leukocytosis, vomiting during the attack, and a slight rise in the pulse-rate. On palpation there is usually tenderness present just below the right costal arch along the outer border of the right rectus muscle. If the patient is seen just after an attack one can best elicit this tenderness by hooking the fingers deeply from above

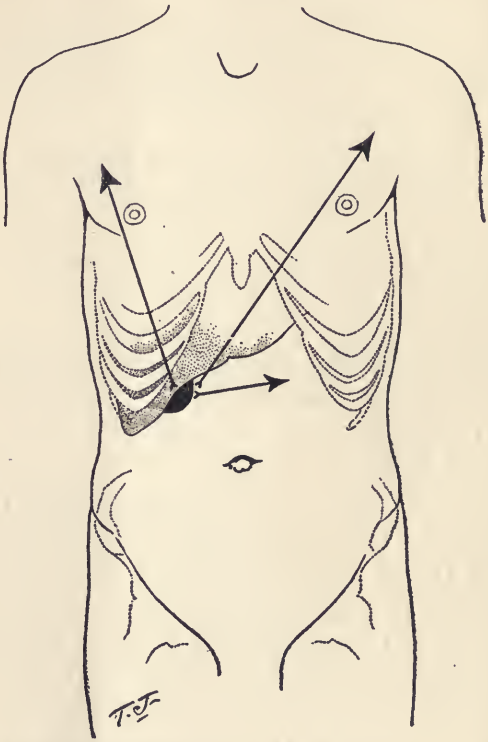

Fig. 252.—Arrows indicate various directions in which pain radiates in acute cholecystitis with or without calculi.

beneath the costal arch while the patient is asked to take a deep breath. In some cases a distinct ovoid, elastic swelling is to be felt over the area of tenderness due to the tensely filled gall-bladder, but one can be readily deceived by mistaking for it the rigidity which is usually present in these cases in the right upper quadrant of the abdomen. If the liver is located at a lower level than normal or if there is a so-called long, pendulous gall-bladder, all of the local findings just described may be most marked at the level of the umbilicus or even lower, as far down as the level of Poupart's ligament (Fig. 253).

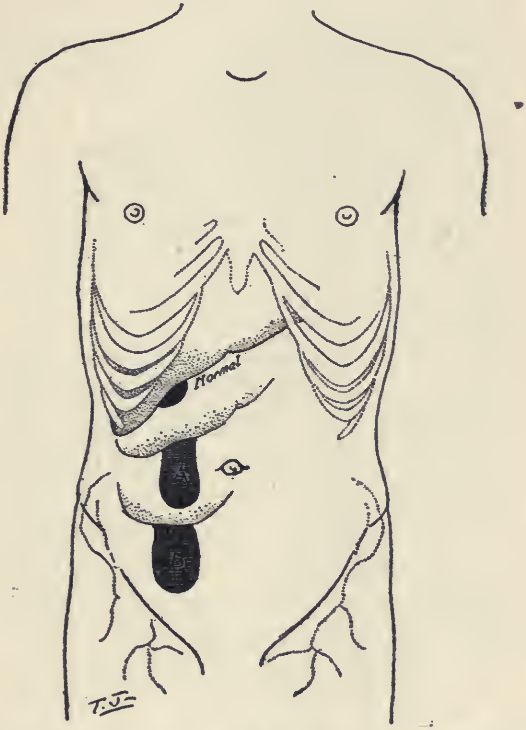

Fig. 253.—Location of gall-bladder when liver is in its normal position and in different degrees of ptosis of the liver (*A* and *B*).

Icterus is not a symptom of acute cholecystitis with or without calculi. It may be present in slight degree during the attack, but disappears rapidly as soon as the inflammatory symptoms subside, and even if present is never of as deep a tint as is the case in infection with or without calculi in the common duct.

b. *Acute choledochitis, with or without calculi.*

Calculi within the common duct give rise to more or less typical symptoms in about 80 per cent. of the cases. These are:

(*a*) *Jaundice.*—If the calculus is firmly impacted at any portion of the duct the jaundice is intense, sudden in onset, and permanent until the calculus is either passed spontaneously or removed at operation, or until the inflammatory swelling of the head of the pancreas subsides sufficiently to allow bile to pass alongside of the calculus into the duodenum. I mention the head of the pancreas because it is at this lower end of the common duct—*i. e.*, just above or at the ampulla of Vater—where an obstruction of the common duct is most frequent as a result of the impaction of calculi. Acholic stools (clay colored) accompany the jaundice.

(*b*) *Chills and Fever.*—They are a very frequent accompaniment of infection of both the extra- and intrahepatic bile-passages. The chills and fever recur at irregular intervals, followed by a profuse perspiration, and differ from malarial chills both by the irregularity of their recurrence and the absence of the plasmodium in the blood. I mention this particularly because many such cases have been mistaken in the past, and are still wrongly diagnosed, as malaria, especially when pain and jaundice are not prominent in the clinical picture.

(*c*) *Pain* is not as prominent a symptom of infection (with or without calculi) in the common duct as it is with the same condition in the gall-bladder or cystic duct. The pain is usually located near the median line, but has the same directions of radiation as is true of gall-bladder diseases (see Fig. 252).

Atypical common duct cases.

In about 20 per cent. of the cases calculi may be present in the common or hepatic or even in the intrahepatic bile-ducts *without giving rise to any symptoms whatsoever.* I have already called attention to these so-called silent common duct calculi[1] and emphasized the importance of a thorough examination of the common duct during operations for cholelithiasis when certain indications are present.

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[1] Medicine and Surgery, July, 1917.

The syndrome which has been usually thought to be pathognomonic for calculi in the common or hepatic ducts is jaundice, pain, acholic stools, chills, and fever. Our views, however, have changed in this respect, that we know that an infection (without calculi) within both the extra- and intrahepatic bile-ducts can give rise to practically the same symptoms, including jaundice, as when calculi are present. It is only necessary to remember (Fig. 254) the close relation of the lower end of the common duct to the pancreas. In nearly 95 per cent. of the cadavers examined

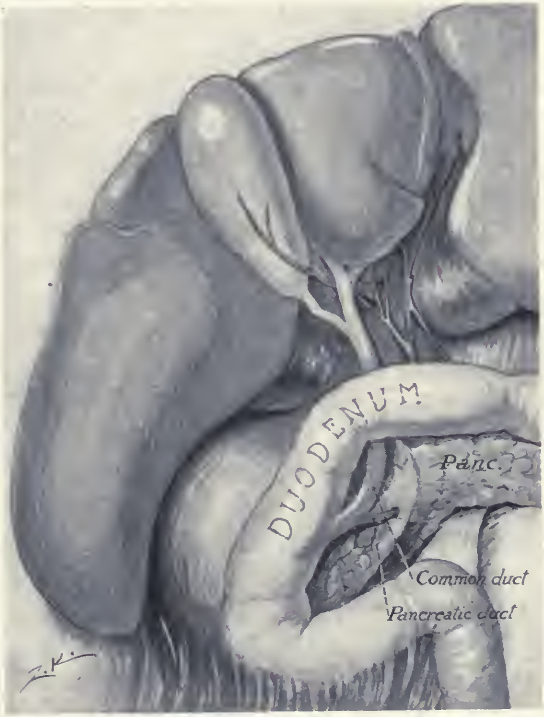

Fig. 254.—Topographic relations of common and pancreatic ducts to duodenum and pancreas (after Zuckerkandl).

by Von Bungner the common duct was found to be completely surrounded by the pancreas, and one can readily understand how either an acute or chronic pancreatitis can cause obstruction to the common duct like that due to a calculus and favor the spread of infection within it.

c. *Intrahepatic infection; cholangitis with or without calculi.*

The symptoms of infection within the liver itself if still confined to the bile-ducts and to the immediately adjacent tissue do not differ enough from those mentioned in the previous class—*i. e.*, common duct cases—and cannot be differentiated from them.

Before leaving this subject of acute infections of the biliary tract it is well to recall to your mind the fact that cases of carcinoma of the gall-bladder may, on account of the acute infection accompanying them, simulate to such an extent an acute cholecystitis as not to be recognizable until the malignant condition is disclosed at operation. Again, it is important to remember that certain complications of gall-bladder infections may change the clinical picture considerably. I refer especially to cases of pericholecystitic abscess due to perforation of the gall-bladder wall and to those of formation of an abscess between the gall-bladder and the abdominal wall, or between the gall-bladder and one of the adjacent viscera, or, finally, in the right subphrenic space. If the latter condition occurs the symptoms due to it completely change the clinical picture, and the underlying condition of gall-bladder infection is completely overshadowed by the symptoms of subphrenic abscess.

Perforation of the gall-bladder into the general peritoneal cavity does not, as a rule, give rise to the same severe initial symptoms as will be mentioned under the head of perforated gastric or duodenal ulcer. There is usually a history of preceding gall-stone attacks, but aside from this one cannot distinguish the symptoms of peritonitis due to such a perforation in the majority of cases from those due to perforation of other upper abdominal viscera.

Abscess of liver.

Solitary Abscess.—This must be thought of whenever a patient complains of pain in the right upper quadrant of the abdomen, radiating to the right shoulder and accompanied by irregularly recurring chills, fever, and sweats. It is most common in tropical countries as a complication of amebic dysentery, but the latter occurs often enough in our northern climate to think of a solitary abscess when the symptoms I have just enumerated are present, and a search should be made for the Amœba coli in the stools. If the abscess is situated close to the convexity or lateral aspects of the liver, an area of dulness may be found extending upward from the liver and an absence of the normal respiratory excursion in the costophrenic sinus. I have called attention[1] to the great value of the *x*-ray in making an early diagnosis of abscess of the liver situated near the diaphragm as well as of subphrenic abscess, and can warmly recommend both the fluoroscopic and stereoscopic plate methods from day to day whenever these are available. Icterus is not a typical symptom of a solitary abscess, but is more frequently present in multiple abscesses. It is necessary to differentiate such a solitary abscess when fever is present, especially when accompanied by irregular chills and sweats, from multiple abscesses of the liver (see below), from a subphrenic abscess (see below), from infection within the kidney (pyelonephritis), and also from an encapsulated empyema between the lower lobe of the lung and diaphragm. Exploratory puncture should only be performed whenever an *x*-ray examination is not possible, and then only just before an operation, because one is very apt to infect the abdominal or thoracic wall if a long interval exists between the time of puncture and that of operation.

Multiple Abscesses of the Liver.—These are almost invariably secondary to one of two conditions: (*a*) Infection somewhere along the course of the portal vein—most frequently the appendix (Fig. 255); (*b*) as a complication of calculi in the intra- or extrahepatic bile-ducts or even as an extension of a severe infection (acute choledochitis) from the common duct into the finer bile-ducts within the liver. I have already described[2] the first condition as a complication of appendicitis in a previous lecture, and have described the second cause of multiple abscesses under

[1] Surgical Clinics of Chicago, 1917, vol. i, p. 1035.

[2] Ibid.

the head of acute infections of the gall-bladder and bile-passages (see above) today.

The septic condition of the patient overshadows the local symptoms to such an extent that when the severe chills, fever, and sweat cycles recur at irregular intervals one does not think of an intrahepatic infection. I have known such a dread complication to occur both in cases of severe appendicitis with a generalized peritonitis and in much milder forms of appendicitis where the appendix was gangrenous, but the prognosis for an uneventful recovery seemed beyond doubt until the symptoms of sepsis

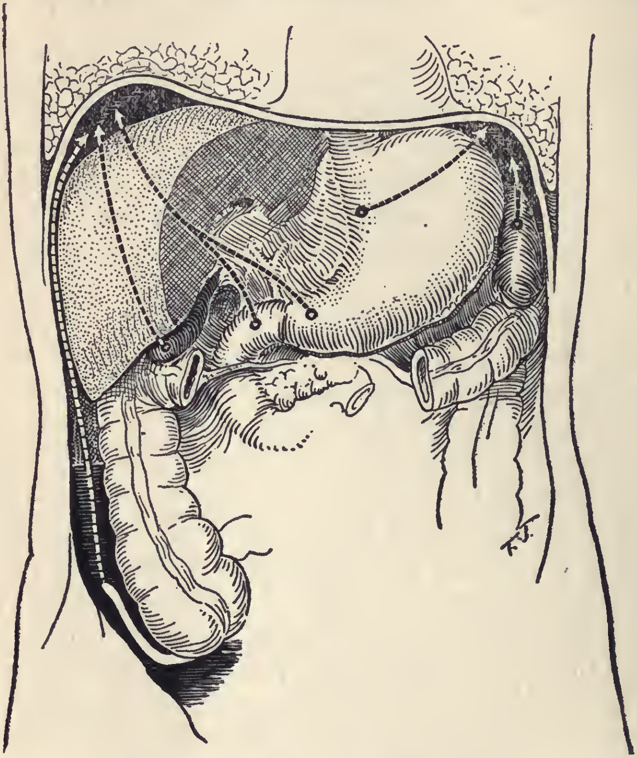

Fig. 255.—Most frequent primary foci of infection in subphrenic abscess. On the right side the arrows indicate how infection reaches the subphrenic space from the appendix, gall-bladder, pyloric region, and duodenum. On the left side the arrows show routes of infection from lesser curvature of stomach and from spleen.

with irregularly recurring fever, chills, and sweats appeared as indicating an extension of a suppurative thrombotic process from the veins of the appendix to those within the liver.

The previous history of an appendicitis or of infection within the biliary tract will be of the greatest aid in differentiating this acute condition from that of a severe infection within the kidney, especially when there are but localizing signs referable to the latter organ. A diagnosis of malaria covers a multitude of errors of omission in cases presenting chills, fever, and sweats as the most prominent symptoms, and should never be made unless the Plasmodium malariæ is demonstrable.

Subphrenic Abscess.—In the lecture on complications of appendicitis[1] I have referred to the occurrence of this acute condition. It may also follow infection or perforation of the gall-bladder, perforation of a gastric or duodenal ulcer, or an infection of the kidney or spleen.

One must always think of this condition when fever and other evidences of infection persist after one of these various primary affections has been operated upon or exists. If the primary cause is in the gall-bladder, right kidney, duodenum, pyloric end of stomach, or appendix the abscess is to be found somewhere beneath the right half of the diaphragm. If the underlying disease is in the posterior wall or lesser curvature of the stomach, spleen, or right kidney, the secondary abscess is in the left subphrenic space (Fig. 255).

Comparatively few of the cases present any local signs, such as pain, tenderness, rigidity, etc., hence the diagnosis in the majority of cases must be one of exclusion as to the cause of the symptoms of infection when it occurs either as an apparently primary acute abdominal affection or when it is secondary to an operation for one of the lesions just mentioned.

The fever is of a continuous type, chills not being present unless the abscess is the result of the extension to the subphrenic space of an intrahepatic infection. In such cases the symptoms of the latter condition completely overshadow those of the subphrenic abscess, and a differential diagnosis is only possible before operation by an x-ray examination. Exploratory puncture should never be done unless one is prepared to operate immediately afterward.

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[1] Surgical Clinics of Chicago, 1917, vol. i, p. 1035.

In the majority of cases of subphrenic abscess the diagnosis can be made from the following data:

(*a*) Fever and other evidences of infection as a complication of one of the primary conditions enumerated above.

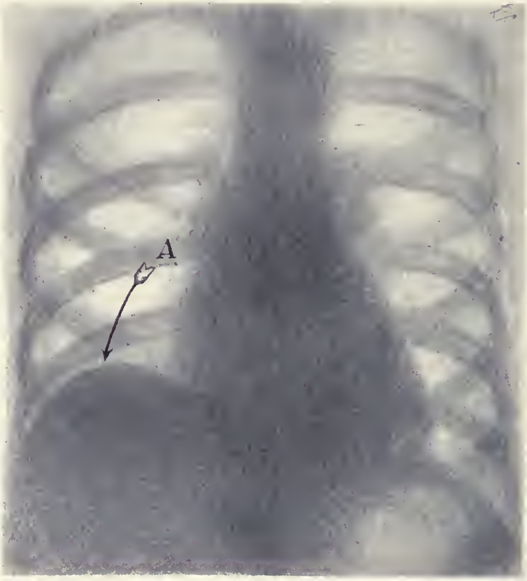

Fig. 256.—Typical convex shadow seen in the x-ray plate of case of subphrenic abscess. Arrow *A* points to the upward bulging shadow seen at right dome of diaphragm.

(*b*) x-Ray examination shows irregularity in outline and movement of diaphragm (Fig. 256).

(*c*) Evidences of dulness (irregular in outline) along upper border with more or less displacement of liver downward on right side and of circumscribed areas of dulness close to diaphragm on left side.

(*d*) Exploratory puncture reveals pus.

2. *Stomach and duodenum.*

(*a*) Perforation of benign or of malignant lesions.

I was under the impression that only the perforation of an ulcer of the stomach or of the duodenum could give rise to acute symptoms until recently, when a case in which perforation of a carcinoma of the posterior wall[1] caused me to change my opinion. The view held by many clinicians that a perforation of a benign ulcer of the stomach or duodenum always gives rise to acute symptoms must also be revised.

Moynihan and Lund were the first to direct attention to a group of cases of subacute perforation in which the symptoms are very indistinct, and the first suspicion of a perforation is when the local signs of encapsulated suppuration are found before and confirmed at operation as having had their source in the perforation of a gastric or duodenal ulcer, the location of the abscess, of course, varying with that of the ulcer and being found either in the general or lesser peritoneal cavity.

The more acute perforations take place into the general peritoneal cavity with no tendency toward walling off of the spreading infection. In the first hours the differential diagnosis must be principally made from that of an acute pancreatitis (see below) on account of the proximity of the viscera. The most important data upon which to base a diagnosis of perforated gastric or duodenal ulcer are the following:

(*a*) Pain—sudden, paroxysmal, and severe—referred at first to epigastrium in both gastric and duodenal ulcers, but also to right side of abdomen in duodenal ulcer (especially to right iliac region).

(*b*) Muscular rigidity and tenderness in same areas as pain or tenderness. In the case of a duodenal perforation cases have been erroneously diagnosed as appendicitis in the early stages because of the prominence of the right-sided symptoms.

(*c*) Collapse—not so severe as in acute pancreatitis, and appears slower.

(*d*) History of gastric or duodenal ulcer. At times patient has been under medical treatment for one of these conditions.

The above symptoms are only present in the first six to twelve hours. After this period the symptoms are those of a spreading peritonitis. The most valuable evidences of such a wider dissemination of the infection are the increase from hour to hour of the extent of the muscular rigidity (Fig. 257) and tenderness accompanied by a corresponding steady rise in the pulse-rate. Vomiting, obstipation, and abdominal distention are symptoms of a more advanced peritonitis. They do not appear until long after the diagnosis should have been made to be of avail if the patient is to be operated upon.

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[1] Described in Surgical Clinics of Chicago, February, 1917.

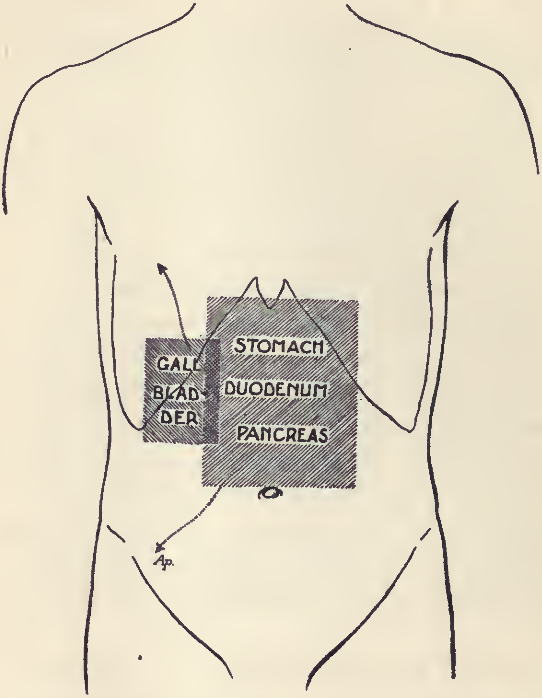

Fig. 257.—Typical locations of areas of rigidity and tenderness: *a*, In perforation of gastric or duodenal ulcers and in acute pancreatitis; *b*, in acute affections of biliary tract.

Acute Dilatation of the Stomach.—This usually occurs as a complication of operations in the upper abdomen, appendix, and for peritonitis from any cause. It may, however, be found as an acute condition independent of these causes, *e. g.*, in pneumonia, gastritis, and many other conditions, and should be recognized and gastric lavage done to save a life. It is seen clinically in one of two forms:

(*a*) Symptoms of upward displacement of the diaphragm (cyanosis, dyspnea, shock, rapid pulse), with marked prominence of epigastrium and tympanitic note extending well up into thorax.

(*b*) Same symptoms as above, accompanied by vomiting without much effort of large quantities of brownish, sour fluid.

The condition is usually due to a paresis of the gastric musculature and requires immediate recognition[1] and treatment.

3. *Acute affections of the pancreas.*

In a recent case I was able to make a diagnosis of acute pancreatitis before operation from the following data: Two days before admission to the hospital the patient, a woman of fifty, had been taken suddenly with a most intense and constant pain localized just between the ensiform and umbilicus, in the median line. The pain continued for the greater portion of the first twenty-four hours, and shortly after its onset was accompanied by vomiting. Upon admission to the hospital the case was at first thought to be a spreading peritonitis due to perforation of one of the hollow viscera of the upper abdomen (stomach, duodenum, or gall-bladder). I was, however, struck by the collapsed appearance of the patient. Her eyes were sunken, nose pinched and cold, lips and finger-nails bluish, skin cold and clammy, and pulse very small and soft. The abdomen, although uniformly distended, was not rigid or tender. Laparotomy was performed, and upon opening the peritoneal cavity the presence of hundreds of areas of fat necrosis on the omentum and peritoneum and the escape of the "beef-broth" colored fluid at once confirmed the diagnosis. In another recent case I expressed the opinion that a patient, a woman of fifty-six, had a very virulent form of infection of the gall-bladder complicating cholelithiasis on account of the extremely septic appearance of the patient, the high fever, and the absence of rigidity over the gall-bladder region, although tenderness was still present. Upon opening the peritoneal cavity we noted at once the presence of innumerable whitish areas on the omentum and suspensory ligament of the liver. The gall-bladder was intensely inflamed and contained many calculi.

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[1] Surgical Clinics of Chicago, 1917, vol. i, p. 1035.

I have mentioned these two forms of acute pancreatitis because in the first case the clinical picture was that of the hyperacute type, while in the second patient the pancreatitis was of the acute or perhaps subacute form, in which the pancreatitis is milder and only a complication of an acute cholecystitis with or without calculi.

Recent articles by Deaver,[1] Watts,[2] and Linder[3] have been of great service in calling our attention to the most important clinical features, as well as to the possibility of early operation if a diagnosis can be made.

There are three forms of acute pancreatitis, according to Deaver, as follows:

(*a*) *Hyperacute.*—Sudden onset, with most severe and steady pain lasting twenty-four hours in the epigastrium, accompanied by symptoms of shock and vomiting, followed rapidly by those of collapse. The upper abdomen is distended, but not rigid or tender.

(*b*) *Acute.*—Sudden, but less severe onset. The vomiting is a more marked feature and is accompanied by obstinate constipation, so that the clinical picture simulates that of an intestinal obstruction. The upper abdominal distention becomes more generalized, so that a spreading peritonitis from perforation of an upper abdominal hollow viscus is often thought of. There is a history of preceding attacks of gall-stones in many cases. Suppuration with the formation of a soft, tender mass follows, as a rule, in this form.

(*c*) *Subacute.*—The symptoms resemble those of an acute cholecystitis with or without calculi, *i. e.*, pain in the epigastrium, vomiting, etc. Very often a cholecystitis accompanies the pancreatitis, as in my second case referred to above, and may have been the cause of the subacute pancreatitis.

The differential diagnosis is well summed up by Watts as follows:

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[1] Jour. Amer. Med. Assoc., 1917, 69, 434.

[2] Ann. Surg., 1918, 67, 278.

[3] Jour. Amer. Med. Assoc., 1917, 69, 266.

Perforated gastric or duodenal ulcer.	Ileus.	Acute pancreatitis.
1. History of gastric disturbances.	1. Pain severe, but not as intense as in pancreatitis.	1. Pain agonizing, but no rigidity and but little tenderness.
2. Marked rigidity and tenderness (early) in epigastrium.	2. Collapse comes on slower.	2. Rapid onset of collapse symptoms.
3. Higher temperature and white blood count.	3. Vomiting and obstipation most marked feature.	3. Upper abdominal distention gradually spreads to other regions.
		4. Vomiting and obstipation not as prominent a feature as in ileus.

Having taken up the acute affections of the upper abdominal viscera (excepting the spleen), I shall discuss the diagnosis of the remainder of the acute abdominal conditions in our next lecture.

CLINIC OF DR. WESLEY J. WOOLSTON

Cook County Hospital

MALIGNANT DISEASE OF THE CERVICAL STUMP AFTER SUPRAVAGINAL HYSTERECTOMY

Summary: Demonstration of a patient who developed carcinoma of the cervical stump three years after supravaginal hysterectomy for fibroid; summary of 60 reported cases.

Three years ago this patient was admitted to the Gynecological Service at the Cook County Hospital with the following complaint:

The patient has been able to feel a large mass in the lower abdomen. Complains of pain in back and sides when on her feet. Has had dysmenorrhea, flatulence, constipation, frequency of urination, and leukorrhea of a brownish color, but not hemorrhagic.

The first symptom which she noticed three years ago was a frequent desire to urinate and the development of a cystocele. After her attention had been called to it she noticed a tumor mass in her abdomen which she could easily feel. There have been no hemorrhages during the past year. Menstruation has been as usual, with the exception of dysmenorrhea. Patient feels well, although she thinks she has been losing weight. She has no cough and there are no lung findings; no edema of the feet; no shortness of breath. She has frequent attacks of headache and a slight neuralgia of the face. She gets up two or three times at night to urinate.

Sexual History.—Menstruation began at twelve years; twenty-eight-day type; duration seven days; dysmenorrhea. Last period began November 6, 1914, and was similar to others in all respects.

Obstetric History.—Married for twenty-three years. The oldest child is twenty-one years old and the youngest child is twelve years old. She had one miscarriage eighteen years ago. She has had leukorrhea for twenty-one years. Patient was torn at time of delivery. Puerperium was normal each time.

Past History.—Measles, whooping-cough, and mumps.

Physical Examination.—The patient is a well-nourished colored woman who does not look ill. Head and neck are negative. Pupils are normal and react to light and accommodation. Teeth are in good shape. Cervical glands are not palpable. Thyroid gland is somewhat enlarged. Thorax is well developed and symmetric. Apices are resonant and lower borders are movable. Breath sounds are vesicular and there are no râles. Heart sounds are distant, but regular in rhythm and intensity; no murmurs.

Abdominal walls are muscular. The lower abdomen is pendulous and is filled with a hard tumor mass extending to the umbilicus. There is no tenderness or muscle spasm.

Pelvis.—Introitus is relaxed. Cystocele present. There is a white discharge present. The cervix is large and indurated, and the entire pelvis is filled by a large nodular, firm, and immovable mass continuous with the uterus.

Clinical diagnosis is cystocele, lacerated cervix, and fibroid of the uterus.

Examination of the blood shows 8700 leukocytes and 80 per cent. hemoglobin.

Urine is negative.

The patient was operated at that time, the operation consisting of an anterior colporrhaphy, perineorrhaphy, supravaginal hysterectomy, and appendectomy, leaving the left ovary.

Present History.—The patient returned to Cook County Hospital January 5, 1918, with the following history:

Since the last operation she had been in fairly good health, except for bladder trouble, until last March, when she began to bleed slightly from the vagina. Since that time the bleeding has become somewhat worse each month, at times being continuous. There were periods of a week or more when there would be no bleeding. For the last two months the bleeding has been excessive. She has been under medical care, the doctor giving her some medicine internally. The day before Christmas the patient bled excessively, and a physician who was called advised her to go to the hospital.

Present Complaint.—Bleeding from vagina, chills and fever, loss of weight. The chills came on December 24th, lasted from one to five minutes, and recurred at frequent intervals, followed by slight elevations of temperature. The loss of weight has been gradual, about 15 pounds in the last year.

Family history is negative. Has one son, twenty-four years of age, living and well.

Habits are good. Urinates two to three times at night.

Physical Examination.—Head, neck, and chest are negative. Abdomen shows the scar from the previous operation. No tumors are palpable and there is no tenderness. There are no palpable inguinal glands. Perineum is normal. No edema of extremities and knee-jerks are normal.

Blood-pressure is 112 systolic and 60 diastolic.

Vaginal examination shows the anterior vaginal wall relaxed, tender, and bulging somewhat. The cervix is low, quite large, edematous, and bleeds easily. The os admits one finger.

Diagnosis is carcinoma of the cervix.

Operation.—After the usual preparation the vagina and cervix were swabbed with tincture of iodin. A median abdominal incision was then made, excising the old scar. The ureters were located at the pelvic brim and the peritoneum was incised over them as far as the broad ligaments. At this point they were followed through the broad ligaments by blunt dissection, and a ligature was passed around the uterine vessels as far out as possible through this opening. The bladder was pushed back to the point of exposing the anterior vaginal wall. Two large clamps were then placed on the upper portion of the vagina, which was then cut across. The cervical stump, upper portion of the vagina, and parametrium as far out as our ligatures were then removed. Enlarged glands along the iliac vessels and in the parametrium about the ligatures were then searched for, but none found, although several glands were removed.

The regular operation for this condition could not be done, as conditions following the supravaginal hysterectomy were present which made it necessary to change our technic. The first operator had peritonized the tissues so well that few adhesions were present. The ovary left *in situ* at the first operation had become cystic because of the cutting off of its blood-supply. It was removed.

Pathologic report showed a squamous-celled carcinoma, but due to a misunderstanding slides were not made of the parametrium adjacent to the line of incision, so we are not sure that our incisions were all made in healthy tissue.

Comments.—In reviewing the literature on this subject we find that about 60 cases have been reported. Chrobak[1] was probably the first to call attention to the possibility of the development of this condition. He reported 3 cases, of which 2 were carcinoma and 1 sarcoma.

In this country Currier[2] was perhaps the first to report cases of this kind. Dr. Veader Newton Leonard,[3] of Baltimore, reports 2 cases, and gives a very interesting review of the literature on the subject.

In view of the fact that malignancy does sometimes occur in the cervical stump after supravaginal hysterectomy, the argument has arisen as to the operation of choice in the removal of the uterus. Botzong,[4] in 724 cases of supravaginal hysterectomy collected from representative European clinics, reports a primary mortality of 2.61 per cent., while in 499 cases of panhysterectomy the mortality was 6.6 per cent.

When we consider the fact that fewer than 60 cases of this condition have been reported and that thousands of hysterectomies have been performed, one is led to believe that the condition is not at all as common as we might suppose. Then when we consider that a complete hysterectomy is nearly three times as dangerous as the supravaginal, in the absence of a cervical lesion that we might call a precancerous condition, we feel justified in doing the latter operation. However, we must feel quite sure that the cervix is free from any possible chance of malignancy. The majority of operators seem to feel that a supravaginal hysterectomy is preferable to a complete hysterectomy on account of the greater danger in the latter operation.

Since carcinoma sometimes occurs in myoma of the uterus, it would be well to have a microscopic examination made of these cases, especially where the myoma occurs near the cervix. Many of the cases reported show that the malignancy was no doubt present at the time of operation. The majority of the cases reported followed myomata uteri, as did our own case.

Botzong,[4] Currier,[2] Fleishmann,[5] Freund,[6] Hargraves,[7] Kaufman,[8] Leonard,[3] Lewis,[9] Newman,[10] Noble,[11] Norris,[12] Quenu,[13] Savor,[14] Turner,[15] and Von Ehrlach[16] each report 1 case of carcinoma of the cervical stump occurring in from six months to seven years after supravaginal hysterectomy for myoma of the uterus.

Wehmer,[17] Chrobak,[1] Manton,[18] and Menge[19] each report a case of sarcoma of the cervical stump occurring from three to nine months after supravaginal hysterectomy.

Landinski[20] reports 2 cases of carcinoma following hysterectomy for pelvic infection and ovarian cysts eight years and three years later respectively.

Jacobs[21] reports 2 cases of carcinoma following hysterectomy for myoma each one month after operation. The condition was almost certainly coexisting in these cases.

Chaput[22] reports 4 cases of carcinoma following pelvic infection from one to six years after operation.

Oldshausen[23] reports 2 cases of carcinoma, one following myoma of the uterus, the other of unknown origin, both seven years later.

Schenk[24] reports 1 case of carcinoma four years after the removal of a large uterine tumor.

Lempe[25] reports a case of carcinoma eighteen months after hysterectomy for pelvic infection.

Richelot[26] reports 3 cases occurring from six months to three years after supravaginal hysterectomy for myoma of the uterus. In his article he refers to Hartman[27] and Murtry,[28] who had each had 1 case. Le Dentu[29] reports 2 cases and Pean[30] many more.

Christopher Martin[31] is reported to have had 7 cases, and Ladinski[20] states that he has seen 3 cases in addition to the one noted previously.

Savor[14] speaks of the case seen by Von Hacker,[32] and Oldshausen[23] referred to one noted by Pawlik.[33]

Batigne,[34] Condamin,[35] and Krusen and Hammond[36] have reported cases, and Currier[2] states that Baldwin has had 5 cases. Cullen[37] and Kelly[38] also mention this condition.

Subsequent Course.—The patient made an uneventful recovery and left the hospital in good condition. She has not been seen since. Unfortunately, the patients who are operated at the County Hospital do not consider it worth while to report back to the hospital or the surgeon unless there is some recurrence of the trouble. It is only occasionally that a patient returns to report a favorable result.

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CLINIC OF DR. EDWARD L. MOORHEAD

Mercy Hospital

A SHOW CLINIC: PRESENTATION OF FIVE CASES

Summary: Case I. External urethrotomy—a few points in technic—how to locate opening of urethra into bladder.

Case II. Fracture of both bones of left forearm—fixation by Lane plate.

Case III. Fracture of pelvis—non-interference.

Case IV. Fracture of tibia—reduction by open operation.

Case V. Splenectomy for pernicious anemia—diagnosis—preparatory transfusions; historic sketch; indication and contra-indications for splenectomy.

EXTERNAL URETHROTOMY

Our first patient this morning is forty-eight years of age, a clerk by occupation, and was admitted to the hospital April 19, 1918, on account of retention of urine.

He gives a history of an attack of gonorrhea twenty years ago. About fifteen years ago there was retention of urine, which was treated by passing of sounds and a metal catheter. Following this there has been more or less difficulty in urination, it being slow, dribbling, and painful, resulting finally in this attack of retention. This retention was relieved for the time being and the patient given urotropin (5 grains q. i. d.).

Upon examination with sounds there was found to be an impassable stricture of the deep urethra. You all know the indications for external urethrotomy—strictures of the deep urethra, which are dense and unyielding, impassable stricture, and stricture complicated by extravasation of urine, perineal abscess, fistula, attacks of retention, chronic cystitis, which can only be relieved by perineal section and drainage.

The patient having been prepared in the usual manner, I performed an external urethrotomy on him yesterday. There is nothing new that I can tell you regarding the operation, but a point or two might be emphasized which simplifies the operation a little.

First, when the urethra is opened upon the sound or grooved staff, pick up either side of the urethra with a fine suture, drawing each to one side, with the staff withdrawn partly and turned out of the perineal wound, the apex of the triangle is the point at which the opening of the urethra into the bladder should be. Attention to this point will frequently save a great deal of time and avoidance of making false attempts to enter the bladder. Again, after the introduction of the catheter into the bladder, I am in the habit of tacking it with one small perineal suture, tied in a bow knot, merely to avoid its expulsion during the first few days.

During my intern days it was necessary for me, one night, to replace a catheter in the bladder of a patient operated upon that day, where no provision was made to retain the catheter, and the memory of the experience has always remained with me.

The patient is quite comfortable, the bladder may be irrigated for the present cystitis, and after a few days the catheter will be withdrawn. In the after-treatment it is well to have these patients report each month for a short time, and pass a sound.

FRACTURE OF BOTH BONES OF LEFT FOREARM

This patient is forty-two years of age, an artist by occupation, and was admitted to Mercy Hospital with a history of having been struck across the left forearm with a piece of gas-pipe while engaged in a fight. The forearm was slightly swollen, and upon motion pain was severe and crepitus obtained.

The *x*-ray plate shows that the injury produced a fracture of radius and ulna about the junction of the middle and lower thirds (Fig. 258). The following day an attempt was made to reduce the fracture and a cast applied. While the position was apparently good, the *x*-ray plate showed that there was overlapping of the fractured ends of the bones. March 12th an operation was performed and a plate with four screws applied to the radius. The result is, as you see (Fig. 259), practically a perfect apposition of the ends of the radius, and the position of the ulna is very good without applying a plate to it. Just a word about applying plates in bone work. Try to drive the screws straight, keeping the plate in line, and avoid buckling or tilting of the edges of the plate. This wound healed primarily, the plate remains *in situ*, and the patient is now using the arm without discomfort.

I want to call your attention especially to this patient. He is of great surgical interest to us, when I tell you that previous to his coming here he has taken an anesthetic on forty-seven different occasions for plastic work upon his nose. He says that his nose was destroyed by lupus vulgaris, and when he was about eighteen years of age he began his series of operations to improve the deformity. In this he has been unfortunate, as you can see from the many scars upon his arms and body, and yet the operations have failed to provide him with a nose. He tells me that this work has been done by men whose names you all know if

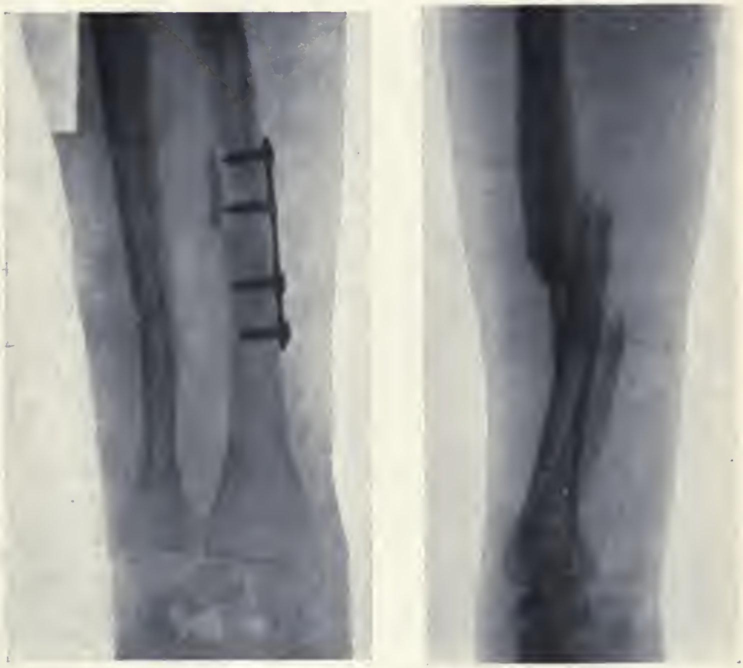

Fig. 258. Fig. 259.

Figs. 258 and 259.—Fracture of both bones of the forearm—open reduction and internal fixation with Lane plate.

I should mention them, and I assure you that the failures have not been due to any lack of skill or ability on their part.

FRACTURE OF PELVIS

This little girl is six years of age. She was referred to me for operation about twenty-four hours after receiving an injury from being run over by an automobile. One wheel of the automobile passed over her body from above the crest of the ilium on the right side to her left thigh. Following the injury the child vomited, and there was blood in the urine and also in the stool. When she was admitted to Mercy Hospital there was a swelling above the pubes and to the right side which was quite painful to the touch. The general condition of the child was good. There was no shock, and I decided there was

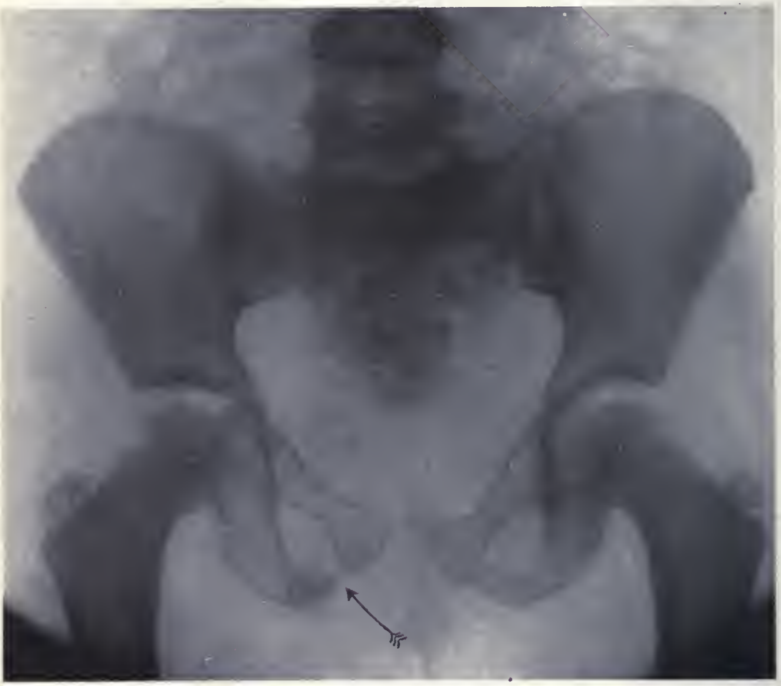

Fig. 260.—Radiogram showing fracture of ascending ramus of ischium and partial separation of ischium from ilium at the synchondrosis.

no urgent necessity for any surgical operation. The following day the urine showed a slight amount of blood and there was also occult blood in the feces. The pulse was 100 and the temperature 101° F. During the next two days the pulse and temperature returned to normal.

From the *x*-ray plate, which was made shortly after admission to the hospital, you can see the injury produced to the pelvic bones (Fig. 260). There is a fracture of the ascending ramus of the ischium of the left side and also a slight separation of the ilium from ischium of the same side.

I show you this case not for what we did, but more for what we did not do. Primarily the case was referred to me for operation for a supposed rupture of the bladder with extravasation of urine, but her condition was such that I considered waiting the best treatment. Today, eighteen days following the injury, the child is able to walk perfectly, there are no signs of any swellings, and both urine and feces are normal.

FRACTURE OF TIBIA

This woman is forty-three years of age and gives us the following history: Five years ago she had rheumatism, which she says principally involved her left knee-joint. This was treated by extension and the application of a cast. Ankylosis of the knee-joint was the result.

November, 1917, an operation was performed to relieve the ankylosis, and by March 2, 1918, the patient states, she was able to move about with the aid of one crutch. On this date she slipped and fell, producing an injury to the limb below the knee-joint. She was removed to a hospital where, on March 6, 1918, a posterior molded splint was applied to the limb. April 2, 1918, the patient was admitted to my service in Mercy Hospital. Patient states that she was told to go about on crutches, but was unable to do so, and hence she changed hospitals. I do not care to say much regarding this case except that upon examination we find that the knee-joint is ankylosed and there is an oblique fracture of the head of the tibia from 1 to 2½ inches below the articular surface, with a backward displacement of the lower fragment, and no bony union. Of course, you can quite readily understand that any attempt at motion made a false joint at the site of fracture.

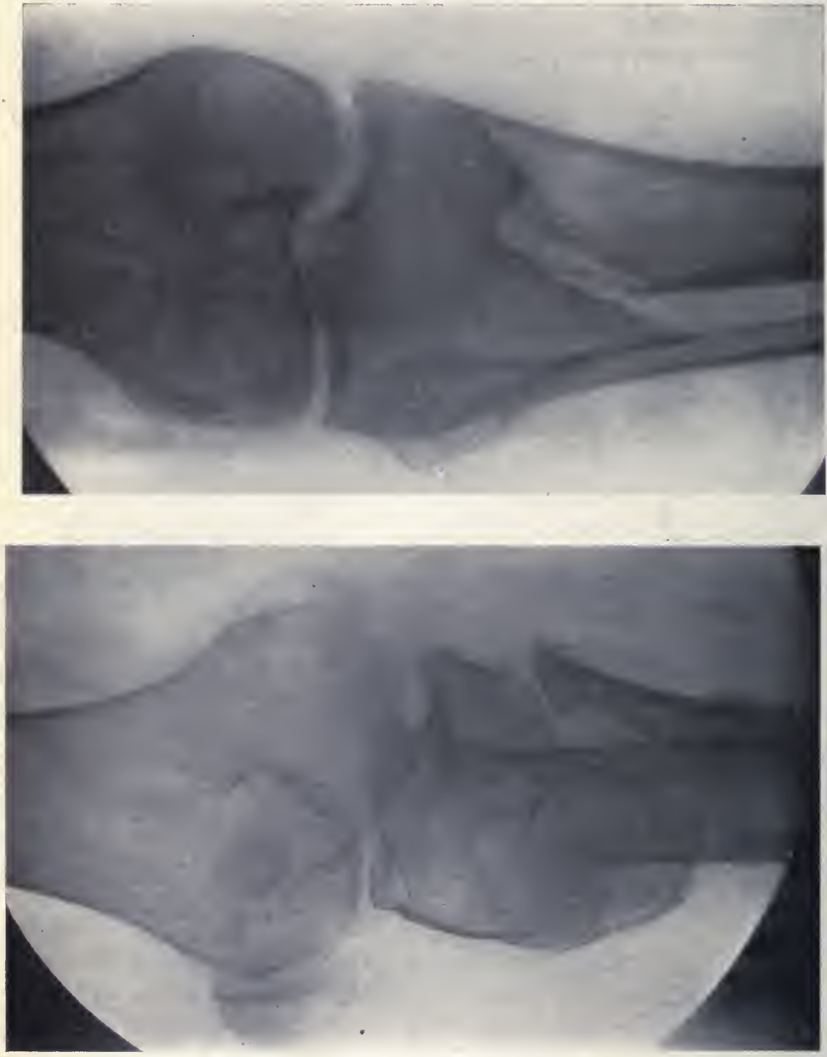

Fig. 262.

Fig. 261.

Figs. 261 and 262.—Anteroposterior and lateral views of fracture of upper end of tibia.

The *x*-ray plates show very clearly the position of the fractured bone (Figs. 261 and 262).

April 9, 1918, an open operation was made and the fractured ends of the tibia were brought into apposition by the application of a plate. It is now nearly four weeks since the operation, the wound healed nicely, and the plate remains. We will allow the patient about six weeks from the time of operation before beginning to use the limb.

SPLENECTOMY FOR PERNICIOUS ANEMIA

I am very much pleased to present this lady to you this morning. We are indebted to my brother, Dr. J. J. Moorhead, who is associated with me, for this case. Some of you may remember her; she was shown at the clinic in January. Briefly, the history is: She is forty-nine years of age. Her illness began two years ago. At first it was noticed that she became tired very easily, would get out of breath, have palpitation of the heart upon the least exertion, and that she was gradually growing paler. Following this the digestive organs became disturbed, and there was loss of appetite, some nausea, and vomiting. Notwithstanding the fact that she received treatment of various kinds, her condition gradually grew worse. Last year she resided in the South for about six months, and thought that she received some benefit from it. However, upon her return to this city her condition became bad again. At the time of her entrance to Mercy Hospital, January 15, 1918, the blood-picture was: Leukocytes, 5100. Erythrocytes, 1,176,000. Hemoglobin, 40 per cent.

Differential:

Poikilocytes,	19	Microcytes,	20
Megalocytes,	28	Normal,	33
		Megaloblasts, occasional.	

The patient was extremely pale. She had lost considerable weight. The spleen was easily felt. She was given sodium cacodylate and a highly nutritious diet in the hope of producing some improvement.

On February 24, 1918, she was transfused 800 c.c. of blood by the citrate method. The blood count then showed: Leukocytes, 5100. Erythrocytes, 1,948,200.

On March 4, 1918, she was again transfused 800 c.c. of blood by the citrate method. The blood-count then showed: Leukocytes, 5300. Erythrocytes, 2,400,000.

March 13, 1918, the spleen was removed. The patient reacted nicely from the operation and her convalescence was uneventful.

March 21, 1918, the blood count was: Leukocytes, 7200. Erythrocytes, 2,664,000. Hemoglobin, 60 per cent.

The patient left the hospital on March 28th, and she now returns to tell us how well she feels. From general appearances, we will all agree with her as to the great improvement in her condition. She states that she has not felt so well in years, is able to work about the house, walk considerable distance without becoming tired, has a good appetite, and has gained 30 pounds in weight. The blood count now is: Leukocytes, 6400. Erythrocytes, 4,100,000. Hemoglobin, 70 per cent.

The spleen was about half again as large as normal and showed evidence of chronic splenitis.

Splenectomy, if we can believe medical history, is not a new operation, but was done for various causes by the ancients. In 1581 Viard removed a spleen prolapsed through a wound. Matthias, in 1678, removed a spleen for the same cause. Quittenbaum, in 1826, and Küchler, in 1855, each removed an enlarged spleen, both cases dying within a few hours from hemorrhage.

Spencer Wells removed a hypertrophic spleen in 1865, the patient dying within six days of either thrombosis or sepsis. Péan, in 1867, successfully removed a cystic spleen.

Splenectomy is indicated in certain cases of splenomegaly accompanied by hemolytic anemia and acholuric jaundice; in Banti's disease before the stage of hepatic cirrhosis; in splenomegaly of the Gaucher type; in certain cases of pernicious anemia associated with chronic splenitis; in some cases of hypertrophied spleen on account of danger of rupture or pressure on other organs, and in malarial hypertrophy with twisted pedicle.

The contraindications are: leukemia, erythemia, when adhesions are extensive, and in such general diseases as syphilis and tuberculosis. In the collected statistics of splenectomy for all causes the mortality is about 22 per cent.

CLINIC OF DR. GOLDER L. McWHORTER

Presbyterian Hospital

SURGICAL TREATMENT OF NEEDLES IN THE HAND

Summary: Six cases illustrating the technic of removal of needles from the hand; necessity of *x*-ray plates; advantages of removal under fluoroscopic screen.

The removal of broken needles from tissues is one of the most difficult of surgical procedures, due, first, to the inability to palpate them; second, to the danger to adjacent tissues of searching for them with a cutting instrument, and third, to the inability to see them until they have been dissected out. The fluoroscope is of great assistance in such cases, and is a great improvement over the time-consuming, extensive, and too often fruitless dissection. A summary of 72 cases at Bellevue Hospital of needles in the hands and feet may serve as an illustration of the difficulty of removal by dissection, for in 53 per cent. of the cases the needle could not be located at the first operation. Of the 53 per cent., 13 per cent. were re-operated, 24 per cent. of the needles being removed at the second operation; 10 per cent. were operated twice without success; 5 per cent. of the needles were discovered at the third trial; and one patient was operated five times before the needle was found.

Many localizers have been advocated, some being accurate, but very elaborate, requiring special apparatus. Bulkley[1] shows the advantages of the microphone in removing needles. The profondometer method, as described by Flint,[2] has proved satisfactory in the trunk. This consists of localizing a foreign body in two planes and of marking the points on a malleable ring, fitted to the body, and then of comparing a tracing from it with a cross-section of the body at this level. Baese's[3] method, while requiring special apparatus, is one of the quickest and most accurate. In his method the anticathode of the tube and the fluoroscope are placed at opposite sides on a revolving apparatus, the foreign object is localized at the center, and since the length of the radius of this apparatus is known, the depth of the foreign body is found immediately by measuring to the surface of the body, and subtracting it from the length of the radius. Bettman[4] has adopted a small fluoroscopic screen, to be attached to the head of the operator and to be raised or lowered as necessary. Knox[5] enumerates the dangers to the patients and the operator of too long or frequent exposure in using the fluoroscope at operation. He recommends the co-operation of the radiologist in the removal or the possible relocalization of the foreign body.

The use of the ordinary horizontal couch with the Roentgen tube under it is very satisfactory for removing needles from the hand. This is true because needles or similar foreign bodies in the extremities may be removed after the preliminary incision by blunt dissection under guidance of the fluoroscope. In other regions important structures cannot be avoided so easily, and blunt dissection for obtaining a grasp of the foreign body becomes impossible.

With the use of the fluoroscope several advantages are obtained. First, a local anesthetic may be used; second, a constrictor to control oozing is unnecessary, and, lastly and most important, the needle may be found through a small incision at the first attempt and in a short time, thus lessening the dangers of injury and infection.

Technic.—For removal of needles from the hand the patient is placed on a table at one side of the Roentgen couch with the hand upon the couch. It is arranged with the usual sterile towels, with the hand prepared for operation. A preliminary incision is made over the site least likely to injure important structures in the approach, and a careful dissection is made down to the approximate position of the needle as previously determined by Roentgen plates taken in two or more planes (Figs. 263 and 264) or by fluoroscopy. Since a careful dissection may immediately reveal the needle in the position shown, it will be unnecessary in many cases to use the fluoroscope at operation.

However, if the needle is not found after a preliminary short trial, the fluoroscope should be used.

The field of operation is covered with a sterile towel, over which the fluoroscope is placed. The operator must work below the screen, introducing a small pointed hemostat to determine the position of the needle. If it is not possible to grasp the needle with the hemostat, the hand is placed at right angles, the hemostat withdrawn, and reintroduced in the proper plane, after which the needle is carefully withdrawn. Instead of turning the hand, in order to determine whether the hemostat is near the needle, the Roentgen tube may be moved. In case blunt dissection is undesirable, one or more needles may be inserted in contact with the foreign body and used as a guide to dissect down to it.

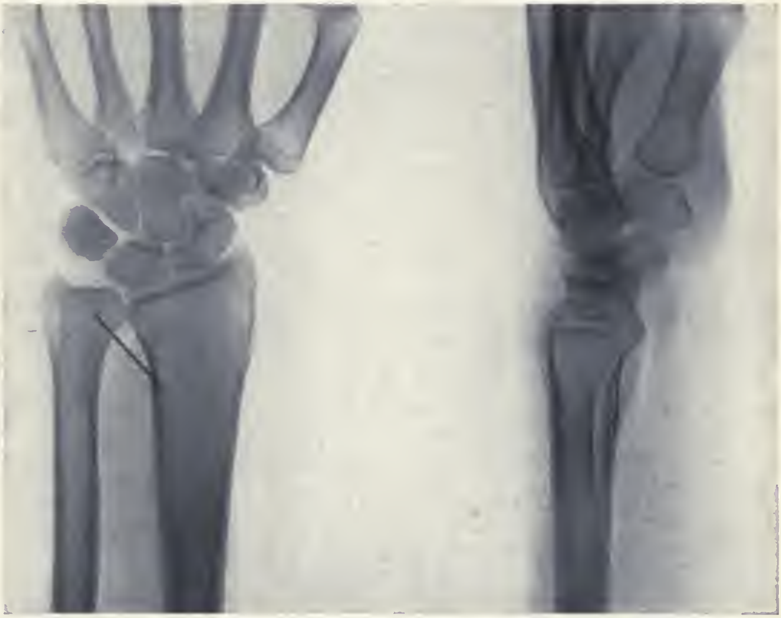

Fig. 263.—The broken needle is lying over the lower end of the radius and ulna (Case I).

All cases with needles in the tissues should be operated if seen early. If the needle has been in the tissues some time and is causing no chronic discharge, infection, pain, or loss of function, it may be allowed to remain (see Case VI).

In illustration of what I have just said I present a short abstract of 6 cases I have recently seen:

CASE I.—F. D., female, aged forty. Patient broke a needle off in her right wrist the day before examination. Roentgenogram (Fig. 263) reveals broken needle lying over radius and ulna. Removed quickly by blunt dissection under fluoroscope, after preliminary incision under local anesthesia.

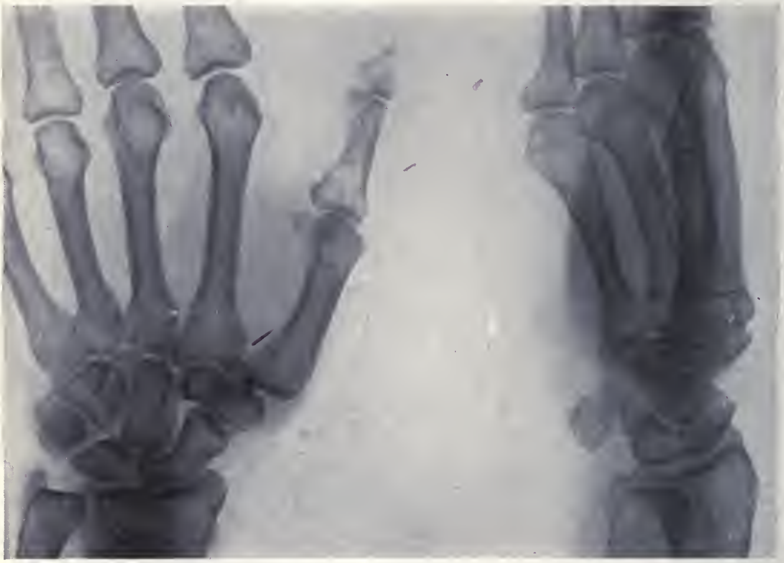

Fig. 264.—The needle is wedged in the apex of the first metacarpal space (Case II).

CASE II.—K. A., female, aged forty-nine. Four months previously patient ran needle in hand and had little discomfort until recently, when she found pain severe on using hand. Roentgenogram (Fig. 264) shows broken needle in the very apex of the first metacarpal space. With local anesthesia an attempt was made to remove it under the fluoroscope by trying to grasp the broken end through a palmar incision. This end was wedged between the bones and could not be grasped. Therefore a dorsal incision was made, the point seized, and the needle promptly removed.

Case III.—J. C., female, aged twenty-two. Patient ran broken needle in hand two days previously. Roentgenogram revealed broken needle in palm of hand, near base of middle finger. Needle removed under local anesthesia by dissection without aid of fluoroscope.

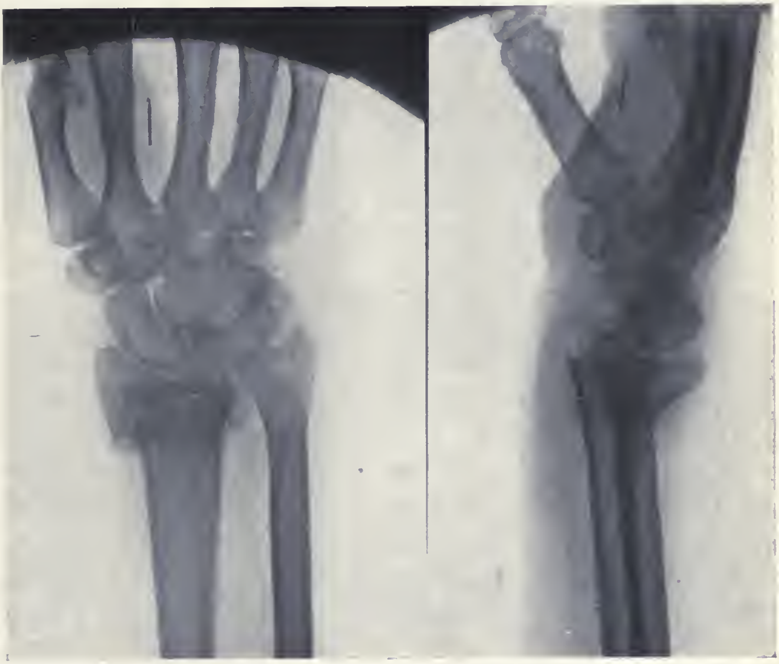

Fig. 265.—Roentgenogram taken for fracture of radius reveals a broken needle which has been in the hand fifteen years, at present causing no symptoms. Needle not removed.

Case IV.—G. G., female. Two weeks previous ran needle in base of palm. Roentgenogram revealed needle deep in thenar eminence. Needle removed after tedious dissection without fluoroscope under general anesthesia.

Case V.—Mrs. B. Patient broke needle in right wrist one week previous. Was operated elsewhere under local anesthesia two days before entrance, with failure to find needle by dissection. Roentgenogram revealed needle lying anterior to radius and ulna in wrist. Needle removed from among deep tendons in wrist after long, tedious dissection, without aid of fluoroscope.

CASE VI.—M. C., female, aged fifty. Three months ago patient fell and broke wrist. She complained of loss of function since. Roentgenogram (Fig. 265) revealed broken needle in palm of hand. Patient states she stuck a needle in base of hand fifteen years ago, but did not know it broke off there. Following this, she had severe pain in her hand and was unable to use it for about eight months, since which time she has had no symptoms from the needle. It was not removed.

These cases show clearly the necessity of good Roentgen-ray work in this branch of surgery, and especially emphasize the important place which should be given to the fluoroscope.

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ISOLATED AND COMPLETE DISLOCATION OF THE FIFTH CARPOMETACARPAL JOINT: OPEN OPERATION

Summary: Rarity of uncomplicated dislocation of fifth metacarpal; technic of reduction by open operation; result after three weeks.

In a careful review of the literature I have been able to find no record of a dislocation of the fifth carpometacarpal joint unaccompanied by other dislocations. However, dislocations of the first carpometacarpal joint are of quite common occurrence without or with a fracture through the base (Bennet's fracture). This is largely explained by the exposed position of the first metacarpal to direct or indirect trauma, especially in striking the thumb knuckle with the hand clinched, and also by the difference in the type of articulation. The first joint is saddle shaped, with a capsular ligament, having considerable motion and consequently more liable to be dislocated than the last four joints, which are arthrodial in type, with very limited motion, and bound together with strong dorsal, palmar, and interosseus ligaments.

Burk[1] was able to collect only 24 instances of single or multiple dislocations of the carpometacarpals, with exception of the thumb, and reported 1 case. He found that 40 of these metacarpal dislocations were dorsal and 20 anterior. The fifth metacarpus was dislocated seven times dorsally, completely in all cases; anteriorly five times, three times completely. While isolated dislocations of all of the other metacarpals were reported, the fifth was associated always with other dislocations. All metacarpals were dislocated in 3 cases, the last four in 5 cases, the last two in 4 cases. In one case the fifth metacarpus was dislocated anteriorly, while the other metacarpals were dislocated dorsally.

One case is reported by Poulain and Poulain[2] of dorsal subluxation of the fifth metacarpus associated with dislocations of the second, third, and fourth. Lop[3] reports one case of anterior dislocation of the fifth metacarpus associated with a subluxation of the metacarpophalangeal joint and a severe lymphangitis preventing early reduction. He operated after twelve days, obtaining a good functional result. The reduction of dislocations of the last four metacarpals is reported to be simple by extension and pressure if seen early. In old cases reduction is impossible.[3]

This patient, a young man aged twenty-three, entered the Presbyterian Hospital April 27, 1918, and was discharged May 6, 1918. Two weeks before entering the hospital he fell on his right hand with the fifth finger extended and struck the side of the hand over the metacarpus. The pain was severe, the hand became very swollen, and there was complete loss of function. The fingers were in a fixed, semiflexed position. The roentgenogram (Fig. 266) revealed the fifth metacarpus dislocated so that the base was anterior to the third. The shadow of the process of the os hamatum extended toward the shaft, and might easily have been confused with a fracture with separation of a part

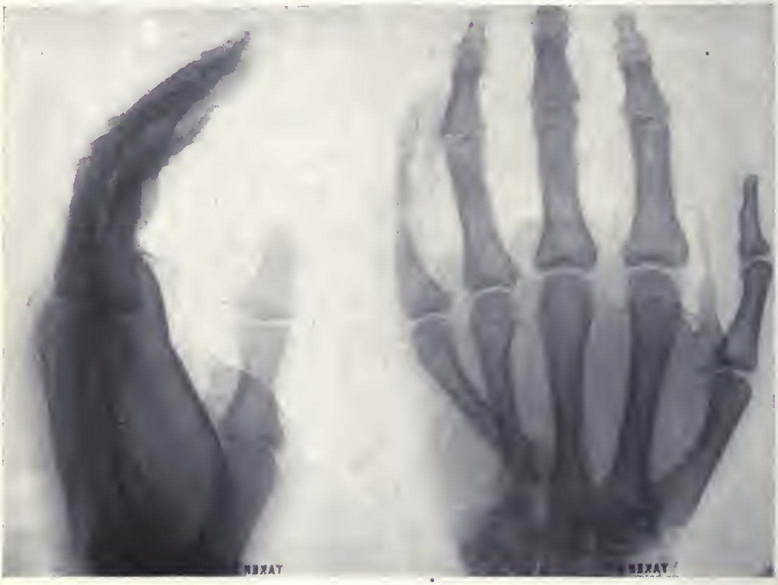

Fig. 266.—Complete, isolated, anterolateral dislocation of base of fifth metacarpals.

of the base. The prominence of the fifth metacarpus could not be definitely palpated because of the swelling of the palm.

Operation (April 30, 1918). Ether anesthesia. An attempt at reduction of the dislocation was made without an operation. The middle of the palm was placed longitudinally on the edge of a triangular block and extension of the little finger was made with pressure of the block against the displaced base of the fifth metacarpus. The bone was immovable and an open operation was necessary. An incision was made on the dorsum of the hand over the usual location of the shaft and base of the fifth meta-

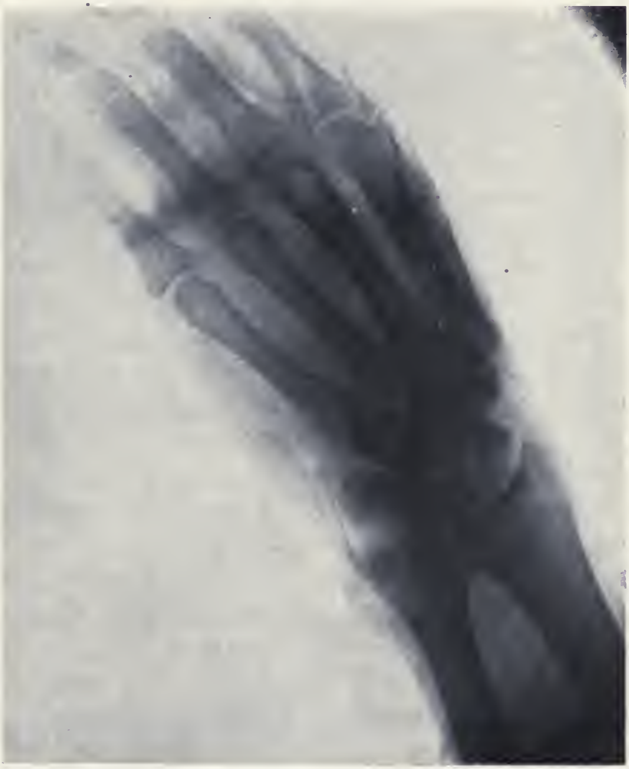

Fig. 267.—After operation—satisfactory reduction. The shadow of the hamulus process extends across the joint. Marked functional recovery in three weeks.

carpus. The base and shaft were found, as shown in the roentgenogram, anteriorly displaced and in the middle of the palm over the third metacarpal bone. The displaced bone was firmly surrounded by edematous muscle and dense tissue. The base was firmly fixed, and resisted an attempt to pull it out with a hook around the shaft. I then passed the hook directly around the base, pulled the bone free, and placed it in a normal position. The base of the fifth metacarpus was absolutely bare of any ligament or tendon attachment. The extensor and flexor carpi ulnaris had been torn away with the joint ligaments and also some of the muscles attached to the shaft. A catgut suture was tied around the base, attached to the torn ligaments present on the os hamatum and to the torn extensor carpi ulnaris tendon. A roll of gauze was placed longitudinally in the palm to prevent a tendency to displacement. Molded splints extending to the elbow were put on anteriorly and dorsally, with the fingers straight, and a tongue depressor splint was placed on the medial side of the hand, bridging over the base of the metacarpal to prevent pressure upon it from the roller bandage.

The roentgenogram (Fig. 267) taken after operation reveals a normal position of the bones. One week later the wound was healed, and the splints shortened to allow use of fingers. At the end of two weeks daily massage was given, and in three weeks, as you see, there is good function.

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CLINIC OF DR. HARRY CULVER

Cook County Hospital

PYELONEPHRITIS

Summary: Routes of infection—importance of lymphatic transmission; hematogenous infection; the ascending intra-ureteric route; predisposing causes—causal organisms—colon bacillus in 85 per cent. of all cases; the three cardinal symptoms—chills and fever, pain in the back, painful, frequent urination; diagnosis—necessity of careful differentiation—twenty-one errors in a series of 90 patients with proved pyelonephritis entering the Cook County Hospital in 1917; illustrative cases; treatment—relation to the bacteriologic diagnosis—the value of irrigation of the renal pelvis.

The unsettled state of the question of renal infections has led to considerable experimental and clinical investigation, the results of which thus far have tended to make the confusion more pronounced than ever.

This is especially true of the routes of transmission. Until recently it was thought that all renal infection was transmitted directly from the bladder by way of the lumen of the ureter. This idea was finally discarded, since it was thought impossible for bacteria to travel against gravity and the urinary current, this method of infection being possible only in the presence of obstruction to the emptying of the bladder, or mechanical or inflammatory narrowing of the ureter, either condition causing the accumulation of urine in the kidney pelvis. Draper and Braasch failed to produce ascending infections unless a high intravesical pressure was maintained over a considerable time, while Caulk suggests that there must be an incompetent ureterovesical valve associated with increased vesical pressure before infection can possibly occur by way of the lumen of the ureter.

How are the many instances of so-called ascending urinary infection to be explained, since the usual direct route is no longer considered a possibility in the ordinary case?

A vast amount of work has been done on the extension of vesical tuberculosis to the kidneys by way of the lymphatics, and more recently this path has been emphasized as being a possible route of non-tuberculous infection by Sweet and Stewart, Eisendrath, and others. It has been found that there is an indirect lymphatic connection between the bladder and the renal pelvis, and a similar indirect connection between the pelvis and the various divisions of the renal parenchyma. Sigimura found the lower part of the ureters constantly involved in a series of cases of acute cystitis. This he considers due to lymphatic transmission, as the mucous membrane showed only slight involvement, while the lymph-channels and adventitia were markedly involved. Francke has demonstrated a direct lymphatic connection between the right kidney capsule and the ascending colon. Attention has been directed toward the anastomoses of the lymphatics of the female genitalia with those of the bladder and ureters which may explain the many instances of vesical and renal infection following pelvic operations. This finding also serves to explain the numerous infections during pregnancy and the puerperium, as well as the many renal infections in young girls, since 50 per cent. of infant girls examined give a positive colon bacillus culture from the vagina on the second day after birth.

Sweet and Stewart concluded that the extension of infection occurs along the lymphatics of the ureteral wall. This contention is based upon experimental work in which uretero-intestinal anastomoses were made with a constant production of renal infection. Eisendrath has been able to trace the course of infection from the bladder to the kidneys through the lymphatics of the ureteral wall. This was done by making serial sections of the ureters and kidneys. These infections were produced by intravesical inoculation of various pyogenic micro-organisms into dogs with previously sterile urines. As the cultures of the blood taken just before death were found sterile, he concluded that the ureteral lymphatics transmitted the infection, and suggests that similar lymphatic connection may carry infection from the prostate and seminal vesicles in the male and from the pelvic organs of the female to the kidneys without obstruction to the urethra or ureter and with an intact ureterovesical valve.

The theory that renal infection for the most part is blood-borne has been made a prominent one by the work of Cabot and Crabtree. They point out that such insoluble substances as fat and cinnabar pass through healthy kidneys, and direct attention to the work of Biedl and Kraus, who found that colon and anthrax bacilli as well as staphylococci can pass through a normal kidney without the production of lesions. It has been claimed that 10 per cent. of all pulmonary tuberculous patients pass tubercle bacilli in the urine even in the presence of apparently normal kidneys. These pyogenic organisms, however, are capable of producing marked renal lesions under proper conditions. The severity of the lesion produced depends upon the type and virulence of the bacteria together with the local condition of the kidney and the general resistance of the individual. Cabot and Crabtree obtained colon bacilli from blood-cultures in 40 per cent. of their patients suffering from acute pyelonephritis. They cite instances where positive blood-cultures were obtained before the organisms were found in the urine. These studies were made on prostatics with indwelling catheters, so that an opportunity was presented to study patients from the very onset of infection. There is much experimental and clinical evidence now at hand to substantiate their contention that cortical abscesses, capsulitis, capsule abscess, multiple septic infarcts, perinephritic abscesses are produced by coccus infections for the most part, while the colon group of organisms tend to infect the pelvis and adjacent collecting tubules. The bacillary infections cause severe disturbance of renal function and often early marked prostration of the patient, but rarely require surgical intervention, while the coccus infections, although not usually causing marked early distress and decrease of renal function, are much more liable to need surgical treatment some time during the course of the infection.

This selective activity of these groups of bacteria for different parts of the kidney tissue is apparently associated with their pus-forming ability. Those organisms which cause few leukocytes to be called out, organisms of relatively low pathogenicity, may move through the kidney tissue without mechanical obstruction; while other bacteria, which at once produce leukocytosis, local and general, and are considered of greater pathogenicity, are mechanically obstructed and produce lesions where they first find lodgment. This serves to explain why the pus-producing staphylococcus causes renal parenchymal lesions, and the less pyogenic colon bacillus tends to pass through the renal tissue and primarily involve the renal pelvis.

Cabot and Crabtree suggest that the chief rôle of the lymphatics in the transmission of renal infection is to spread the infection throughout the kidney once a local hematogenous focus has been established. Almost never is a single portion of a kidney involved in an infectious process, and then only when an abnormality of the kidney, such as double pelvis or a blocked-off portion of a single pelvis, exists. It is generally conceded that most renal coccal infections are blood-borne, as seen following such conditions as furunculosis and osteomyelitis. Why then should colon bacillus infections have an entirely different route of transmission? These authors believe that the lymphatic connection between the bladder and kidneys is long and indirect, and suggest that most probably organisms do enter the vesical and ureteral lymphatics, to be emptied into the blood-stream and then produce renal infection. This assertion is supported by the work of Thiele and Emberton, who found that organisms injected intraperitoneally reach the blood-stream and are excreted by the kidneys, but if the thoracic duct of the laboratory animal be opened so that the bacteria can escape no such excretion takes place.

The recent work of David further complicates the matter, as his findings support the old idea of ascending infection directly up the lumen of the ureter. By carefully controlling his experiments on dogs he found that in many instances supposedly normal animals have cellular infiltration of the ureteral wall. He therefore emphasizes the fact that a diagnosis of ascending infection on this finding alone in experimental animals is not sufficient. In all his experiments David made a division and ligation of the right ureter near the bladder, which was inoculated with colon bacilli. The dogs were killed by ether in from one to three days after the inoculation. David's conclusions are as follows:

1. The injection of colon bacilli into unobstructed, non-traumatized bladders is not followed by cellular exudate in the submucosa and muscularis in most instances.

2. Bacillus coli may be isolated from the urine of unobstructed, non-traumatized bladders showing no evidence of microscopic infection as late as a month after its injection into the bladder.

3. Acute high-grade cystitis in unobstructed and obstructed bladders is not accompanied by blood-stream infection.

4. Cystitis in unobstructed bladders is not commonly accompanied by extension of the infection to the upper urinary tract.

5. It is possible in an unobstructed bladder to infect the upper urinary tract by direct extension of the infection from the bladder through the lumen of the ureter.

6. Cystitis in partially obstructed bladders is very frequently accompanied by the presence of the organism in the ureter and pelvis of the kidney, and this extension may take place by the lumen of the ureter, or by direct involvement of the ureter by contiguity, or possibly by way of the peri-ureteral lymphatics and infection of the subpelvic tissue.

7. Evidence is presented to show that ascending Bacillus coli infection of the upper urinary tract from the bladder travels most frequently by the lumen of the ureter.

8. Peri-ureteral infiltration is present only when peritoneal exudate of the bladder or pelvic peritoneal exudate is also present.

9. Peri-ureteral or subpelvic exudate is not synonymous with infection of the urinary stream.

10. In the presence of peri-ureteral or subpelvic infiltration the kidney parenchyma is negative in most cases.

David's conclusions are based on accurate bacteriologic and pathologic work, and must have a bearing in some instances of ascending infection from an infection in the bladder. However, it is a well-known fact that in over a third of the instances of renal infections there is absolutely no involvement of the bladder. Clinically, the involvement of the bladder appears to be secondary to the renal infection in most cases. This direct route of infection by way of the lumen of the ureter is most apt to occur, as seen by experiment, when there is partial obstruction to the urinary outlet. This finding also tends to reduce the importance of this route of transmission, since a very small percentage of patients have any such urinary obstruction. In a series of renal infections recently studied I found but three instances of partial urethral obstruction among 116 patients.

From a careful investigation of all the work on the routes of transmission of renal infection one must conclude that under certain modifying conditions all three theories still deserve recognition.

Infection occurs in kidneys otherwise normal, but a kidney already the site of disease, malposition, or maldevelopment is much more susceptible. Individual constitutional disorders, such as furunculosis, gastro-intestinal disturbances, tonsillitis, prostatitis, seminal vesiculitis, and osteomyelitis, often predispose to renal infection, and in many instances no primary focus can be found.

The organisms most commonly found are colon bacilli and staphylococci, and less commonly the streptococcus, Bacillus pyocyaneus, and others still more rarely. By far the commonest organism found is the colon bacillus, which appears in from 50 to 90 per cent. of all cases, while the staphylococcus comes second and is found in 10 to 20 per cent. of all cases, these two organisms occurring together in not a small number of infections. These instances of mixed infection are supposed by some observers to be primarily staphylococcus infections upon which the colon bacillus has been implanted as a secondary invader. There is no clinical or experimental evidence to support this belief. In a series of 116 patients I found Bacillus coli in pure culture in 74 per cent. of the patients, staphylococci in pure culture in 8 per cent. of the patients, while 85 per cent. of all the cases were infected with colon bacilli in pure or mixed infections, and 16 per cent. of all cases contained staphylococci in pure or mixed infections. Other organisms, as the streptococcus, typhoid bacillus, pyocyaneus and diphtheroid bacilli, and leptothrix, were found, but altogether they represent less than 5 per cent. of all the infections.

Side Infected.—The usual report shows that the right kidney is more susceptible to infection than the left, according to the supporters of the lymph-stream as the route of bacterial transmission. This fact is explained by the lymphatic connection between the ascending colon and the capsule of the right kidney. Others reason that the increased mobility of the right kidney renders it more susceptible to hyperemia and, therefore, more easily infected by organisms which are at times being deposited in it from the blood-stream. It has been said that all cases of renal infection are bilateral except instances of septic infarction, or in those in which there is a pre-existing lesion or anomaly of one kidney. Most statistical reports do not agree with the above statement. I found 58.7 per cent. of 116 patients had bilateral infections and 41.3 per cent had unilateral infections. Of the unilaterals, 48 per cent. were on the left side and 52 per cent. on the right side.

Symptomatology.—While a complete understanding of the mode of transmission of these infections is not possible, it is equally difficult to comprehend the source of such an enormous and varied symptomatology. In typical cases there are certain symptoms and findings which are logically associated with the infection. There are other patients, however, whose symptoms are altogether atypical, and the infection often goes on and on unrecognized until severe destruction of the kidney has taken place, many patients being subjected to unnecessary surgical operations on a wrong diagnosis.

Three symptoms are most commonly complained of, namely, chills and fever, pain in the back, and painful, frequent urination. There are many patients that have none of these symptoms and yet have an infection not to be distinguished pathologically and bacteriologically from the patient complaining of typical symptoms. Some of the less common symptoms are here mentioned in the order of their numeric importance as they appeared in an analysis of a series of patients previously mentioned: Constipation, headache, vomiting, pain in the abdomen, hematuria, loss of weight, pain in the abdomen and back, incontinence of urine, pain over the bladder, retention of urine, pain in the neck and legs. Many of these symptoms naturally, when not associated with others more nearly referable to the cause, would not suggest the condition, but it should always be kept in mind that some renal infections cause symptoms referable to some distant organ and, therefore, misinterpreted. All symptoms vary in intensity and type, but especially is this true of pain in the back, which may be dull and boring over one or both lumbar regions, but may be acute and radiating along the course of the ureter, simulating renal colic. The acute back pains are often associated with more distressing abdominal pains. Good judgment must often be exercised to rule out the peritoneal cavity and its contents as the cause of these symptoms.

The temperature of the patients is, in a general way, dependent upon the acuteness of the infection. In all instances it is of the intermittent type, and ranges from 105° F. to normal. Many severe chronic infections run a normal temperature constantly.

Blood Examination.—Leukocyte counts of the peripheral blood vary with the acuteness or chronicity of the infection, and vary from 40,000 per c.mm. in the acute cases to normal counts in the renal chronic cases. I have made blood-cultures on 10 different patients at various times during their infection and have been unable to get a positive culture. Most of these cultures were taken at the height of their fever curve and soon after a chill.

Bladder Urine.—The colon bacillus infections usually present marked bladder urine findings. While the staphylococcus infections, as a rule, do not cause so much bladder pus, it is even considered anatomically and bacteriologically possible to find staphylococci present in the bladder, having been excreted by the infected kidneys with no demonstrable leukocytes. In suspected cases, however, repeated careful examinations of centrifuged specimens from the bladder will give many positive findings where single examinations are negative. Renal infection cannot be ruled out on the finding of a single normal bladder specimen.

Cystoscopic Findings.—While a majority of patients suffering from pyelonephritis have bladder symptoms and positive bladder cystoscopic findings, about one-third of the bladders associated with such infection are apparently perfectly normal, and this in spite of the constant presence of septic urine. Those with moderate bladder findings predominating present a loss of normal luster, with hyperemia about the trigone, usually most marked about the ureteral orifice, from which the septic urine is coming. A small percentage of patients present marked vesical changes characterized by generalized hyperemia associated with more or less edema, usually localized. Bladder observation is often difficult due to the mucopurulent material present and to the relative intolerance of the bladder to the distending medium. This type of bladder closely resembles those seen with tuberculous involvement, and requires considerable local treatment before the primary cause of the infection can be ascertained by ureteral catheterization. The bladder symptoms seem not to be altogether dependent upon the condition of the bladder, as many patients with apparently normal bladders complain equally as much as some with marked vesical changes, a fact explained on the basis of reflex pain not unlike that seen with renal pelvic stone with bladder symptoms.

Diagnosis.—This can often be suspected on the symptoms, but can only be absolutely made on a careful examination of the bladder urine, followed by ureteral catheterization with a study of the separate urines microscopically and bacteriologically. Renal function tests and radiography together with pyelography may be necessary in classifying the renal lesion.

Physical findings while often not present are important as confirmatory evidence, but not of much importance in making an absolute diagnosis. Palpation may elicit tenderness in the costovertebral angle, most marked when the perirenal tissues are involved. Absence of this tenderness is of no significance. Tenderness and enlargement of the infected kidney is sometimes made out and is of considerable value as additional evidence if it is remembered that the compensatory change of the healthy kidney incident to its increased work may produce these findings. The diagnosis under which 90 patients with proved pyelonephritis entered the Cook County Hospital in 1917 are here given:

Diagnosis.	Number of patients.
Cystitis	12
Pyelitis	10
Renal calculus	8
Pneumonia	8
Salpingitis	7
Typhoid fever	6
Appendicitis	6
Nephritis	4
Abdominal tumor	4
Pleurisy	3
Renal tuberculosis	3
Sciatica	3
Cholecystitis	3
Hysteria	2
Hematuria	2
Uterine fibroids	2
Acute bronchitis	2
Influenza	2
Papilloma of the bladder	1
Malaria	1
Meningitis	1

While these diagnoses represent conclusions rapidly made, they serve to emphasize in a very striking manner the conditions which renal infections may simulate and from which they must be distinguished. As previously mentioned and noted in the above table, acute abdominal conditions are closely simulated. This fact has been made emphatic by the occasional laparotomy performed, finding the abdominal organs normal. Some innocent structure is usually removed during the operation on the operator's guess that it may be the seat of disease. After the operative recovery, however, the symptoms continue as before. The records of a few personal observations may serve to strengthen this point.

Mrs. N. T.: White, female, aged thirty-eight, developed severe pain in the right upper quadrant of the abdomen two months before her last entrance into hospital. She was confined to her bed for a week. Pain subsided and was apparently normal for three or four weeks, when the pain returned as before, accompanied by pains in her back. She was operated at once for retroposition of the uterus, with no relief, so four weeks later a perineal repair was done. The symptoms were not influenced, so she tried another hospital, where a diagnosis of gall-bladder disease was made. On exploration this structure was found normal. After operative recovery she was cystoscoped and found to have a right-sided pyelonephritis (colon bacillus). Her symptoms have entirely disappeared with the cure of this infection.

Other instances similar to the above are numerous and only a few will be briefly mentioned.

H. J.: Female, aged twenty-six. Diagnosis, hysteria. Pain in right lower quadrant. Appendix removed—no relief, Bilateral colon bacillus infection. Cured.

A. H.: Female, aged thirty-five. Diagnosis, cystocele. Pain in right side, both upper and lower quadrants. Ovary and tube on right side removed two months ago with the appendix—no relief. Right-sided colon bacillus pyelonephritis. Symptoms subsided with improvement of the infection.

S. O.: Female, aged twenty-four. Diagnosis, salpingitis. Pain in lower right abdomen. Appendix removed six months ago, with no relief. Staphylococcus infection of the upper pole of the right kidney. Complete ureteral reduplication. Relief of symptoms, but organisms still present.

L. J.: Female, aged forty-three. Pain in back and limbs. Diagnosis, sciatica. Symptoms four years. Cholecystectomy one year ago—no relief. Bilateral colon bacillus pyelonephritis.

E. M.: Female, aged nineteen. Pain in lower lumbar region for nine months. Left ovarectomy nine months ago—no relief. Left-sided pyelonephritis (colon bacillus). Cured.

J. R.: Male, aged twenty-seven. Diagnosis, kidney stone. Pain in right lower quadrant of abdomen. Appendectony one month ago—no relief. Right-sided staphylococcus pyelonephritis. Complete relief of symptoms.

Treatment.—The treatment of pyelonephritis consists of several considerations, any or all of which may apply to an individual case. On the other hand, there are many patients to whom some of these principles do not apply.

If the infection is found to be due to urethral obstruction, it is imperative that this obstruction be relieved before the infection can be influenced. Should the infection producing the obstruction be ureteral, this must be similarly relieved. Equally as important as relieving local renal and bladder conditions is the removal of septic foci present elsewhere in the body which may act as distributing foci for organisms into the blood- or lymph-stream to be carried either directly or indirectly to the kidney. Hence attention must be directed toward instances of intestinal stasis. Teeth, tonsil, prostate, and seminal vesicle infection should be removed, as well as the various infections of the uterus and its adnexa.

With the removal of these factors, which deal more directly with the etiology of the infection, there are certain other agents that may be applied more directly against the disease itself than the removal of its cause.

Urinary antiseptics are found to have an important place in the treatment of these infections. Especially is this so of hexamethylenamin when given in sufficient dosage in the presence of acid urine. It has been shown that its antiseptic value is due to the formaldehyd liberated, which process takes place only in the presence of an acid medium. Since members of the colon bacillus group, for the most part, produce acid during their development, it is not necessary to further acidify this urine. However, in the presence of staphylococcus infection the ingestion of acid sodium phosphate in 15-grain doses three times a day multiplies the antiseptic action of the hexamethylenamin. The maximum of formaldehyd is liberated within a few hours after the administration of hexamethylenamin, hence the practice of giving small doses often repeated is not justified. Overdoses of this drug, indeed, are to be avoided, since it is prone to produce renal and bladder irritation not only aggravating the symptoms, but renal hematuria may readily be produced. It is best to start with 10-grain doses three times a day, and within a few days increase the dose to 15 grains, further increase depending upon the tolerance of the patient. Certain intolerant patients are found who cannot take this drug in sufficient dosage to be of any value. To these salol has been given with benefit.

As previously mentioned, the colon bacillus tends to produce acid and requires acid medium for its maximum development. An alkaline medium, while not completely inhibiting the growth of these organisms, tends to produce adverse conditions for development. One seems justified in producing such a reaction when this infection is present. For this purpose, clinically, sodium bicarbonate in dram doses or sodium citrate in 15-grain doses, to be increased until the urine is distinctly alkaline, seems to give the desired results.

For colon bacillus infections the giving of hexamethylenamin for a week, alternating with alkaline therapy for a week, has produced the greatest therapeutic response and should be given a trial in all instances.

Excepting in the very acute cases the above treatment should be carried out with moderate diuresis produced by the ingestion of large quantities of water.

The treatment by renal pelvis irrigation is still the cause of considerable discussion. Some do not irrigate, but advocate drainage by ureteral catheterization, while others seem not content with either. One cannot resist adoption of one or the other of these methods after watching patients completely relieved of symptoms by one irrigation and bacteriologically cured after three or four irrigations.

The relief of symptoms is not synonymous with cure, as patients are frequently seen leaving the hospital free from symptoms, but with urines positive for the infecting organism, to return within a few months with a complete recurrence of symptoms and the bacterial findings of the first examination. It is logical to assume that during this symptomless period the organisms, though still present, are inactive, but any factor which appears, tending to lower local or general resistance, causes increased bacterial activity with a recurrence of symptoms. Therefore in all cases possible treatment should be continued until the infection has disappeared. This can be determined only by repeated culture. It has been found that a relatively safe manner of determining this condition is to get two successive sterile urines from the infected kidney one week apart.

The determination of cure in these patients is similar to that required for the cure of the carrier state in typhoid fever, wherein it is believed that two successive negative cultures from stool and urine is sufficient to declare the individual free from typhoid bacilli.

The passage of the ureteral catheter will in some instances produce a marked alleviation or complete subsidence of symptoms. Upon this finding it has been advocated that the benefits of pelvic lavage depend upon this factor entirely. Patients whose symptoms are due to ureteral obstruction, inflammatory or otherwise, may be relieved of symptoms by the passage of a ureteral catheter. This, however, is not a bacteriologic cure, as I have had the opportunity of examining such patients after the relief of symptoms and again with a recurrence of symptoms, and found the type of bacteria the same as that producing the original infection. The dangers of forcing infectious material into the secreting papillæ, while anatomically possible, is highly improbable when lavage is carefully performed.

It would seem conservative to perform lavage on all occasions where drainage by ureteral catheter is indicated, thereby getting the advantage of the drainage and the beneficial action of the medicament. Although the solution does not come in contact with all the infecting micro-organisms, its action on the inflammatory tissues tends to increase local resistance. For this purpose 1 per cent. silver nitrate has given good results, and this drug may be used up to 5 per cent., but there is no reason for using this strength. Many disinfecting drugs of various strengths are used, as well as plain water, which acts beneficially in a mechanical way where suppuration is profuse.

As Bacillus coli infections are prone to occur in the pelvis of the kidney and adjacent tubules, while coccus infections tend to localize in the parenchyma, the irrigation treatment should give the better results in the colon infections. This supposition is supported by clinical facts, since it has been found impossible in some instances to influence the bacterial content of staphylococcus urine by pelvic lavage, while this condition occurs only rarely in colon bacillus infection.

CLINIC OF DR. LOUIS E. SCHMIDT

ALEXIAN BROTHERS HOSPITAL

OPERATIVE TREATMENT OF URETHRAL FISTULA

Summary: Demonstration of a successful technic for cure of urethral fistulæ—the inversion method.

URETHRAL fistulæ have always given me rather unsatisfactory results. I have frequently in those cases where the fistula follows a folliculitis, where the fistula is to either side of the frenum, just back of the corona glandis, and where there is no infection present and where the quantity of urine that escapes is very small, advised the patient not to be operated upon, simply because the discomfort from the condition has been rather insignificant and also because the operative results have been very unsatisfactory. In my personal practice I have repeatedly seen cases that have been operated upon where the condition following operation and where the discomfort have been more pronounced than previous to operative interference.

On account of the satisfactory results that I have recently obtained in a series of cases of this type, as well as in connection with artificial fistula produced in the course of a series of operations for the correction of hypospadias, I have thought it desirable to have the procedure which has not failed me in four consecutive cases reported. It is so simple that it almost appears to be too small to do so, but nevertheless on account of the many failures which I have seen in the practice of others as well as those in my own practice, I think that it will be worthy of doing on account of my satisfactory results.

It simply consists of a linear incision (Fig. 268, 1) extending well on either side of the fistula with a circular incision around the fistulous opening. This is done in order to dissect the skin

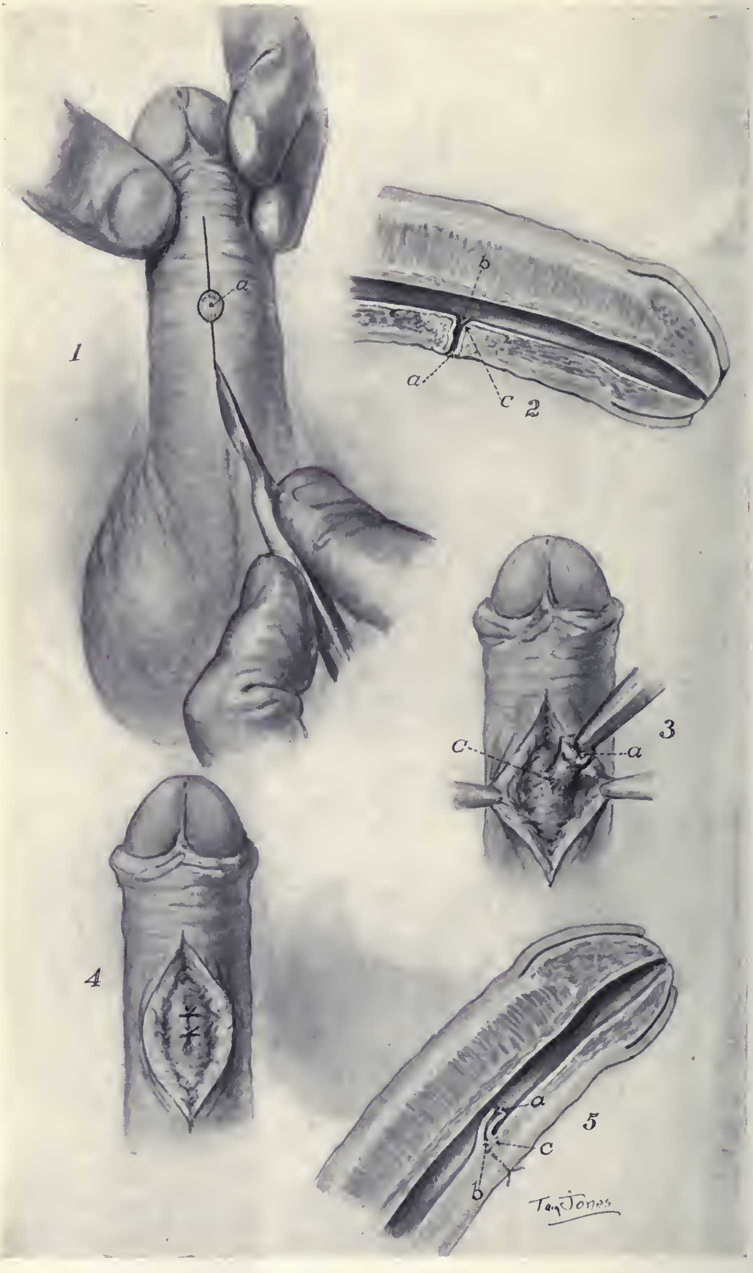

Fig. 268.

from the adherent chronic inflammatory tissue. Above and below the fistula the inflammatory tissue is thoroughly excised. The fistula proper is thoroughly dissected (Fig. 268, 2 and 3), but only at one point (Fig. 268, 2) is all the inflammatory tissue removed up to the urethral mucosa. I wish to impress the fact that the dissection must be exceptionally carefully done at this point so as not to enter the fistulous tract or injure the mucosa. If the dissection is not perfect, invagination (Fig. 268, 5) cannot be carried out, because the fibrous tissue would be sufficiently elastic to cause the fistulous tract to invert itself or go back into its original position. If the dissection is perfect, the invagination is easily carried out, and it remains inverted and the inverted edges remain in contact with each other without pressure or sutures. This gives a contact of raw surfaces depending on the length of the fistulous tract. In two of my cases the fistulous tract was more than 1½ cm. in length. This gives, therefore, a clean surface contact of this length in coaptation. Two superficial fine catgut sutures hold the point where the inversion has been carried out (Fig. 268, 4). After that the fascia as well as the skin is brought together in the ordinary manner with silk or horsehair sutures.

I have examined the cases in the course of two to four weeks after the operation with a urethroscope. In two cases where the fistula was immediately within the external urethral orifice the opening of the external urethral orifice showed the inverted fistulous tract. It protruded into the urethra just as an ordinary polyp. The surface was covered with mucosa. It was possible for me to snip off with scissors this little polyp-like mass, and the urethroscopic examination at a later date showed no change from the surrounding mucosa. In the other case where the fistulous inversion was in the pendulous portion of the urethra I was able to snip off with an intra-urethral scissors the projecting

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Fig. 268.—1. Incision for fistula operation. 2 (*a* and *b* respectively). External and internal mouths of fistula. *c*. Point at which all scar tissue must be clearly dissected and mucosa exposed. 3. Fistulous tract dissected out and mucosa exposed at *c*. 4. Closure at point of invagination by two catgut sutures. 5. Operation completed; fistulous tract invaginated into urethra.

mass, but I was also obliged to cauterize with nitrate of silver on account of a little granulating area which appeared. However, this too healed satisfactorily. I had occasion to see one of these patients about a year after operation, and there were no ill-effects of any kind.

In all instances at the same sitting I perform an external urethrotomy and insert a drain as a preliminary step to this operation for urethral fistula. I do this in order to keep the urethra free from urine passing over this area, and also to avoid catheterization in case retention would set in, and also to avoid the irritation of a permanent catheter which some operators advise. At the time of operation a sound or urethroscope with mandarin is introduced into the urethra so as to permit of more careful dissection. After the inversion and closing of the wound a wick of iodoform gauze is placed into the urethra beyond the point of operation, and so that it will appear at the external urethral orifice through the urethroscopic tube. This wick is allowed to remain in place forty-eight to seventy-two hours. The perineal drain is removed in six to seven days.

TECHNICAL ERRORS IN THE OPERATIVE TREATMENT OF URETHRAL STRICTURE

Summary: Importance of exposing the urethral mucosa at the point of stricture and removal of scar tissue; dangers of the Guiteras guide; the retrostrictural pouch as a cause of persistent dribbling at the end of urination.

In connection with urethral work I wish also to take up some points in connection with the subject of stricture of the urethra. It has been my misfortune, I might say, frequently to see cases that have been operated upon for stricture, and where unsatisfactory results have been obtained. For this reason I think it worth while to point out a few of the little errors in the technic of external urethrotomy which permit of unsatisfactory results.

Take Fig. 269, which represents a stricturous condition of the bulbomembranous urethra with a rather tortuous course of the urethra with the usual dilatation posterior to the stricture. External urethrotomy with a guide is a comparatively easy operative procedure. However, I might even say that frequently unsatisfactory results are obtained in these cases because all the surrounding inflammatory indurated tissue is allowed to remain in place. We begin, even if a guide is passed, to pass through the false opening and the course of the urethra is not followed (Fig. 269, *A*). However, the same thing occurs much more frequently in those cases where the operation is performed without a guide, and by examining Fig. 270 the catheter which is placed in the bladder through the urethra is shown at the site of the operation not to pass through the urethra. The little distortions of the urethra have not been sufficiently carefully followed by the operator, but the operator passes the urethral catheter so that it would appear at the site of the operation, and then, beginning at the centripetal end, easily passes directly into the bladder. Alongside of the catheter, as can be seen in this picture, is also the perineal drain which I am accustomed to depend upon also. It is the failure to carefully split the entire urethra in the stricturous area and the failure to remove the chronic inflammatory tissue which surrounds these portions that prevents satisfactory results.

I make it a habit of always following, and naturally one must be able to recognize, the urethral mucosa. If it is at all possible the upper wall of the urethral mucosa should remain intact no matter how much of the urethral wall it is necessary to remove. Then when the catheter is placed correctly it remains at least in contact with the urethral mucosa the entire distance from bladder to the external urethral orifice.

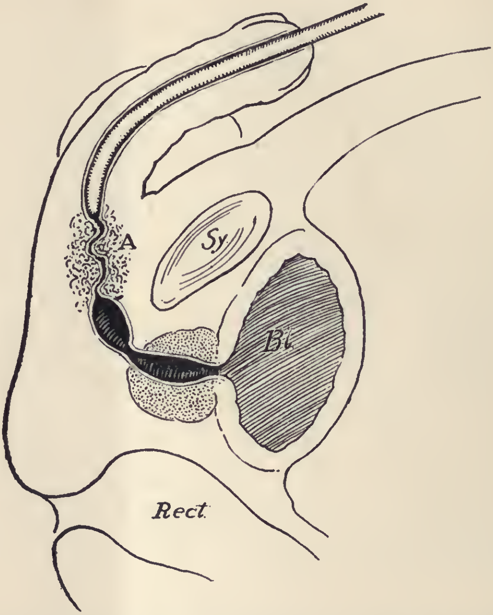


Fig. 269.—Sound introduced into urethra up to point of stricture (*A*). Note dilatation of urethra proximal to stricture—the retrostrictural pouch.

Another one of the reasons for unsatisfactory results in connection with this line of work is the use of such instruments as the Guiteras guide (Fig. 271). This instrument as well as others of this type has been recommended to be used in those cases where the centripetal end cannot be found. Under those circumstances, in order to avoid a suprapubic cystotomy, in order to do a retrograde catheterization, and I might even say for any retrograde catheterization, the same accident can take place, and, therefore, the same results obtained as where this instrument is used through the operative site. This instrument is plunged through the point where the centripetal end is supposed to be located in the direction of the prostatic urethra so as to enter the bladder, but, as the drawing will show, the instrument is plunged through the prostate and oftentimes even into the bladder at a point above or below the internal urethral orifice. These instruments have a groove on the upper surface so that they can be used as grooved directors. If the instrument has been plunged into the bladder and the withdrawal of the mandarin permits the urine to escape, the operator believes that he has entered the bladder through the urethra. Then the little groove is used to direct the scalpel and the incision is made sufficiently large for the introduction of the catheter. Of course, a perineal drain can also be introduced at the same time.

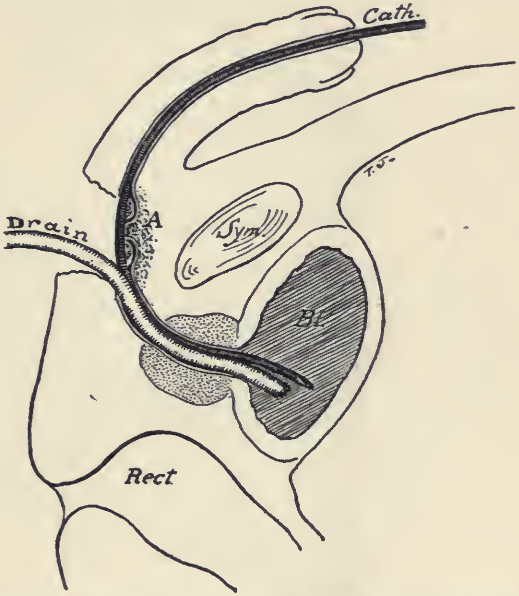


Fig. 270.—Incision to expose stricture; the operator has failed to follow the urethra through the stricture—a common cause of failure to obtain cure.

I have repeatedly seen dire results follow these procedures, and for this reason I thought it desirable to point out what I consider poor technic and the cause of these unnecessarily poor results. If the perineal drain and catheter have been removed in the course of three to ten days, it is perfectly true that the patient will pass urine for a short period of time if the perineal wound has been perfectly healed through the urethra. As a rule, it is scarcely a month until the patient again complains of inability to pass urine with any degree of comfort or ease, and

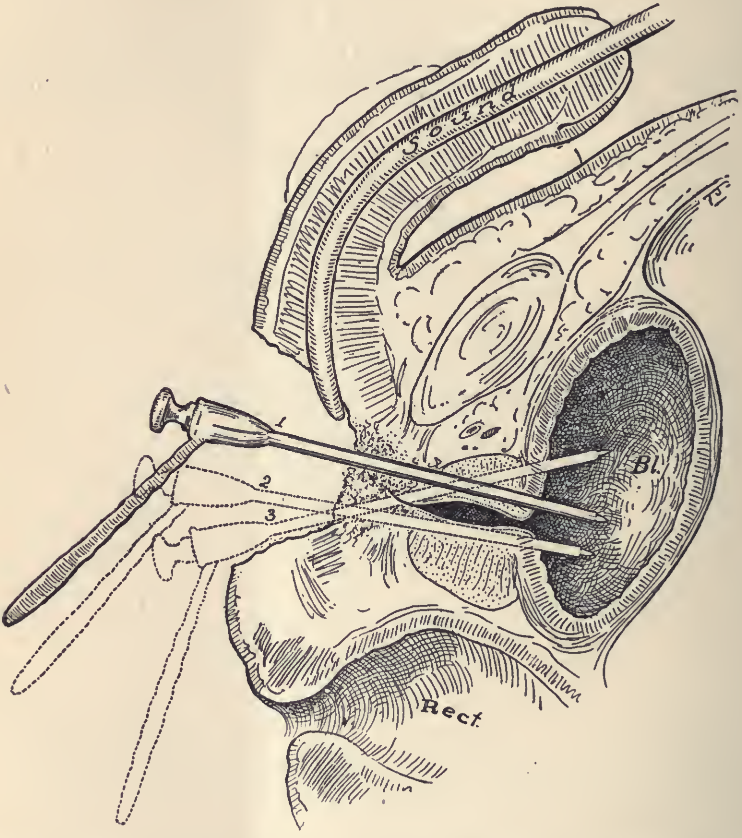


Fig. 271.—Errors in the introduction of the Guiteras guide—failure to follow the urethral mucosa.

attempts at passing sounds are usually followed by chills and fever. Perineal abscesses result, and it becomes necessary to reoperate in such a way as to correct the false passage and also to remove the inflammatory mass, as well as to find the centripetal end and obtain a continuous mucosa if this is possible.

Another cause of unsatisfactory results has been that the operator has permitted the retrostrictural pouch to persist. In other words, the cutting of the stricture is oftentimes not sufficient. If the pouch is permitted to remain, a good deal of dribbling at the end of the urinary act may persist. I have been in the habit in these cases of excising the lower portion of the sac, sufficient mucosa remaining to bring the edges together over the catheter which has been introduced into the bladder. These little matters in connection with external urethrotomies if attended to at the time of operation will always give satisfactory results.

It is not at all objectionable, whenever necessary, to make a resection of the urethra. Whenever it is possible the upper wall of the urethra should be brought together with fine catgut. Naturally, if an end-to-end anastomosis can be carried out in a clean case, it should be done. There are a great many other little technical details which must be observed in order to get good results in individual cases, but these few have repeatedly come to my notice.

CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

FULGURATION TREATMENT OF TUMORS OF THE BLADDER

Summary: Fulguration as an incentive to careful study of bladder tumors; "recurrences" and "new tumors"; technic of fulguration; source of current—type of current; factors influencing duration of treatment—pain, hemorrhage, burning, size of tumor; the instruments—method and site of application; the high-frequency current as a diagnostic aid; reaction edema of bladder wall—importance of its recognition.

June 28, 1918.

We are very fortunate this morning in being able to demonstrate two cases of bladder papillomata in various stages of the disease. One, a woman who has a small papilloma and comes to us for bladder distress and hematuria. The second patient is a man with recurring papillomata. Both cases illustrate the value of using the high-frequency spark in the treatment of bladder papillomata.

There can be no question but that the study of the entire subject of tumors of the bladder has received a distinct stimulus through the introduction of the high-frequency treatment by Dr. Edwin Beer, of New York. Not only has the high-frequency treatment surpassed all other forms of treatment of papillary tumors of the bladder, but it has served as an incentive for closer observation of the patients that have been cured of their tumors. In other words, patients are repeatedly cystoscoped at definite intervals after the tumors have disappeared. Many of the cases of recurrences are thus seen when the tumors are small and can be very successfully treated by one application of the high-frequency spark. Many of these so-called recurrences should be differentiated from new tumors. In the strict application of the word "recurrence" is meant, or should be meant, the presence of a tumor at the site in which the former tumor was found. Careful cystoscopic examination in cases of supposed recurrence has definitely proved that this is not always true, that many of the patients who come back present new tumors, and these tumors are to be found in parts remote from the original tumor. Thus, for example, one occasionally sees the primary tumor situated behind the ureteral orifice, and the recurrence is found on the margin of the sphincter or perhaps in the apex of the bladder, or perhaps behind the opposite ureteral orifice, so that I am becoming firmly convinced of the fact that although we see numbers of these cases that have but one tumor, I cannot help but feel that if such patients were examined at a later date multiple tumors of varying size would be found.

The fulguration treatment is particularly applicable to these so-called recurrences because the patient is seen at a time when the tumor is small, and one treatment usually suffices to cause a complete disappearance of the tumor. In the group of cases in which the patient has been operated upon, as in one of the cases you will see this morning, the patient is always more willing to submit to fulguration than to an open operation. Open operations, as is well known, are followed by recurrences in more than 50 per cent. of the cases. If the fulguration treatment can reduce this large percentage of recurrences it surely is a step in the right direction.

Case I.—Mr. W. McD., single, by occupation a clerk, thirty-four years of age.

Previous History.—Eight years ago the patient was operated upon for a papilloma of the bladder. The usual suprapubic operation was performed. The patient had a rather protracted convalescence. He was free from urinary symptoms for six years. Two years ago the patient noticed that his urine again became bloody and attacks of hematuria have been noted at intervals ever since.

Present Complaint.—Hematuria of two years' duration.

Frequency of Urination.—Began three months ago, so that patient was obliged to void every three hours during the day and was obliged to arise once at night. The condition has not materially changed since its onset.

Suprapubic Pain.—For the past six weeks patient has had more or less pain in the suprapubic region and around the scar of the previous operation.

Physical Examination.—General physical examination is negative.

x-Ray examination for the presence of stone in the urinary tract is negative.

Examination of the urine shows acid reaction, specific gravity 1005; albumin present; blood present; no sugar. Examination of the sediment shows the presence of pus, red blood-cells, and bacilli. Culture of the urine shows the presence of a pure culture of Bacillus coli.

The first cystoscopic examination showed the presence of an exceedingly large papillary tumor in the apex of the bladder, apparently taking its origin from the suprapubic scar. Several similar papillomata are found around the internal urethral orifice, and there are seen multiple papillomata around the ureteral orifices and on the base of the bladder.

The patient was advised to go to the Presbyterian Hospital for fulguration treatment.

Since the fulguration treatment was instituted the patient has received a total of twelve treatments. Cystoscopic examination today shows complete disappearance of all the tumors around the sphincter and of many of the smaller tumors on the base of the bladder and around the ureteral orifices. There is present a large tumor or a part of a large tumor in the apex of the bladder and one large tumor behind the left ureteral orifice. We will fulgurate the patient this morning, using the bipolar current.

Technic.—The patient is prepared as any patient is for cystoscopic examination. The bladder is filled with sterile water and the operating cystoscope is introduced through the urethra. After the cystoscope is introduced the presence of a tumor in the apex of the bladder can very plainly be seen. That this tumor is in the apex of the bladder can be demonstrated by the fact that we are looking toward the apex of the bladder with the cystoscope, and, furthermore, by the fact that an air bubble is visible at the margin of the tumor (Plate I, Fig. 1).

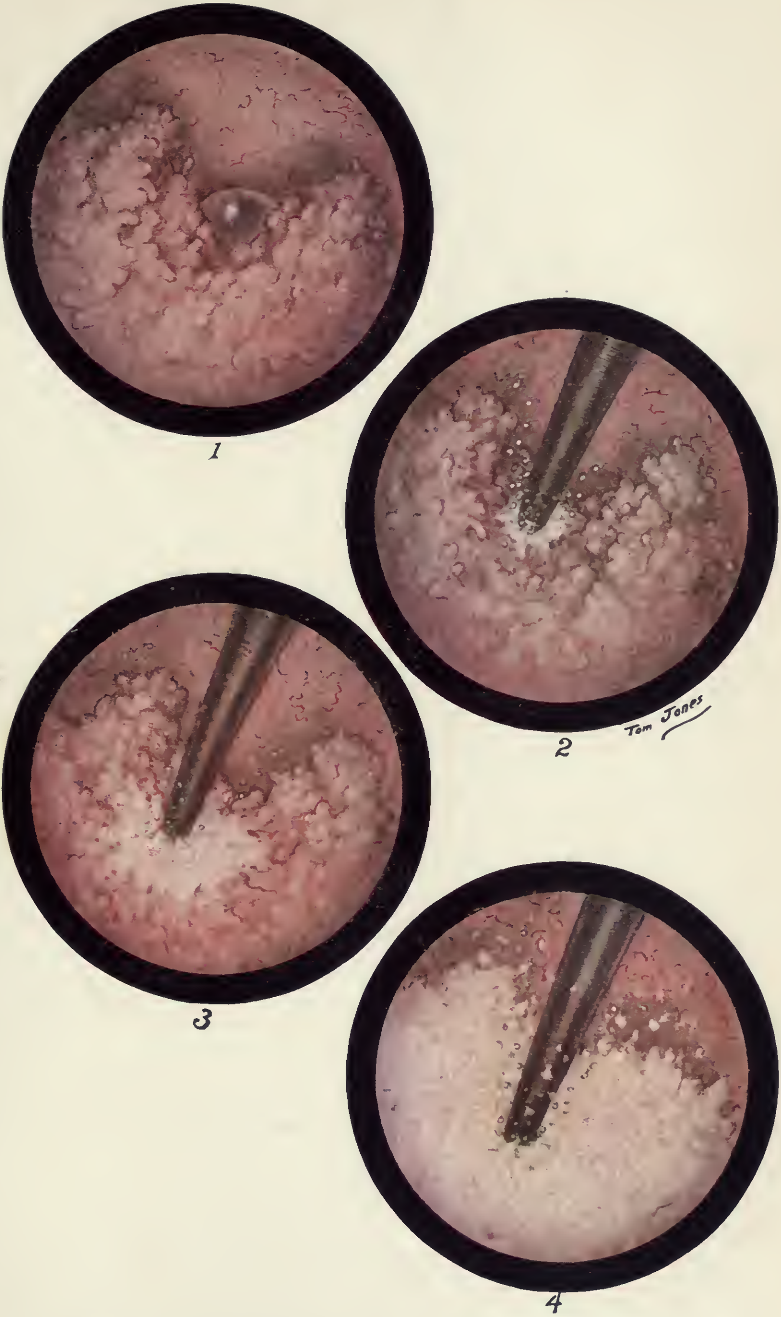
Source of the Current.—The high-frequency current necessary for carrying out this method of treatment is obtained from an apparatus made by Wappler, of New York. The apparatus I use is one of the earliest made by Wappler, and has given us very satisfactory service. Since this machine was designed, several modifications have been made, but these do not possess any advantage over this type of machine, which is portable.

Type of Current.—For this work two types of current may be used. At first a unipolar, or Oudin current, was employed. This rendered us very good service. I believe that Beer uses this type of current at the present time. However, there have been several instances in which it seemed to me that the current was not strong enough to effect a complete cure, that is, to cause all the tumor to disappear. It was then decided to use the bipolar, or D'Arsonval, current. We feel that this type of current has given us the best results and it is the one now used as a matter of routine.

One pole is placed in the bladder by means of the McCarthy electrode, which consists of a large ureteral catheter carrying on its end a metal tip. Inside of the catheter is a wire which carries the current for the heavily insulated electrode. With this electrode there is less danger of short-circuiting of the current into the cystoscope, which may at times amount to a good deal, so that the current does not come out at the end of the electrode and does not, of course, accomplish what we aim to do. The second pole is placed in one of two places, depending upon the location of the tumor. If the tumor is situated in the apex of the bladder, the large flat metallic plate is placed on the abdomen in the suprapubic region. In case the tumor is found on the base of the bladder this flat plate is placed under the buttocks.

In my fulguration work I have always used the operating cystoscope made by Wappler, of New York. By looking through the cystoscope you will see that the electrode has been carried out into the bladder cavity and has been placed against the sur-

PLATE I



1, Intravesical papilloma before treatment; 2, 3, 4, current turned on. Note blanching of tissues as the effects of the fulguration extend peripherally from the fulgurating point. Gas bubbles may be seen rising through liquid medium in bladder.

face of the papillary tumor. By means of the foot switch the current is now turned on and the fulguration is started. If everything is in working order two phenomena may be seen. There can always be seen the emanation of bubbles from the end of the electrode. This is supposed to be due to hydrogen gas. There soon follows a blanching of the surface of the tumor, so that the tumor becomes white and loses its usual papillary appearance. As the fulguration is carried on the entire surface of the tumor becomes white and appears necrotic (Plate I, Figs. 2, 3, 4). In this manner the entire tumor is treated by means of the high-frequency current.

The duration of the fulguration depends upon several factors, chief of which are: First, the patient; second, the operator, and third, the instruments.

The Patient.—Under this heading we first may take up the following: (*a*) Pain; (*b*) hemorrhage; (*c*) danger of burning; (*d*) size of tumor.

Pain.—As long as the intravesical electrode remains in contact with the tumor no pain is experienced by the patient. When working with the base of the tumor or if the electrode comes in contact with the bladder wall, the patient very frequently complains of pain. As a rule during the first fulguration there is no pain, whereas toward the end of the treatment when working near the bladder wall, in treating the remaining tags, the patient at times complains of pain. In instances in which the tumors are very large many applications may be made without the patient's being inconvenienced thereby. In cases in which the tumors are small or where small tumors are to be found on the margin of the sphincter, the patient does experience a certain amount of pain, which, however, lasts for only five or ten seconds, or as long as the current is being applied to the small papillary tumors.

Hemorrhage.—As a rule in treating papillomata the fulguration immediately stops the bleeding for which the patients come to us. Occasionally where the tumors have been given a good deal of treatment a large area of necrotic tumor results, and when this sloughs away the patients have a good deal of hemorrhage. We therefore warn the patients of this possibility by telling them that in about a week when the necrotic tissue comes away there may be a certain amount of bleeding. In our hands this has never been serious enough to alarm us, and if the patients are warned of this possibility they are not frightened.

Danger of Burning the Bladder Wall.—This should always be borne in mind when the tumors are small or when treating the fragments that remain after the large tumors have been fulgurated. While I have personally never met with this condition, I know of one instances in which the operator burned a hole through the bladder, so that immediate laparotomy was necessary.

Size of the Tumor.—As mentioned above, the size of the tumor determines the number of treatments. Small ones generally yield to one or, at most, two treatments. In this case today the patient has received up to date twelve fulgurations, and we have not yet succeeded in completely freeing him of the tumors.

The Operator.—From the operator's end the duration of the treatment may be long or short, depending upon his perseverance.

Instruments.—Short-circuiting the cystoscope so that the light is burned out. While this was rather a frequent occurrence in our early work, it has been practically eliminated by careful attention to cords, rheostat, and fulguration electrode.

In order to reduce the number of fulgurations required in the treatment of very large papillomata, one may reduce the size of the papillary tumor by means of intravesical operations. In one or two instances we have done this by using a cystoscopic rongeur devised by Young, of Baltimore. Instead of this procedure one may employ the old operating cystoscope of Nitze, and with a cold snare remove the major portion of the tumor. After this has been removed one can then fulgurate the base by means of the high-frequency current. The latter method I have never employed, though it has been reported as eminently successful by several workers abroad.

The ideal way, of course, to remove these tumors in the least possible number of treatments would be to apply the fulguration current directly to the pedicle, burning through it, and in this way causing the tumor to be severed from its base in one treatment. In this way we would accomplish just exactly what the advocates of the snare treatment accomplish. While theoretically this may seem an easy procedure, in large papillary tumors it is almost impossible, because one cannot always find the pedicle and hence cannot apply the electrode to it.

In large tumors we have always worked from the periphery rather than from the base, and while it may take a few more treatments, it has always seemed to me to be the safer procedure because of the greater ease with which one can direct the end of the electrode through the cystoscope to the surface of the tumor than to the pedicle.

There are certain limitations to this form of treatment for papillary tumors of the bladder, which I have met but three times. A singular fact in these three instances was that the patients were all males and that they were all very fat, so that one would have much preferred to have operated through the cystoscope than to carry out a suprapubic cystotomy, which procedure became necessary owing to the fact that the tumors were very large and very well pedunculated and situated near the neck of the bladder. The facts in these three cases were such that cystoscopic examination could be carried out so that one could see the large papillary tumor, but because of the size of the tumor, its position and its long pedicle, it was absolutely impossible to manipulate the operating cystoscope and to see just where the electrode was being applied. In each of these instances many repeated attempts to use fulguration failed, and in two of the instances this was carried out under anesthesia, believing that one should not open the bladder for treatment of papilloma if it is at all possible to treat them by means of the high-frequency current.

It has also been advised that the high-frequency current may be used as a differential diagnostic aid in determining whether a given tumor is malignant or benign. Benign papillary tumors respond very promptly to this form of treatment, so that it may be set forth as a clinical axiom that if a tumor does not respond to several repeated fulgurations it is probably malignant, in spite of the fact that it may have the cystoscopic appearance of a benign tumor. While this is a good working rule, one should not rely on it too closely, for in several instances in which large pieces of the tumor were removed with the rongeur and careful histologic study made of them, a diagnosis of malignant tumor was made from the histologic section, yet these patients were successfully fulgurated and there has been no recurrence of the tumor over a period of three years. In the treatment of frank carcinomata of the bladder this treatment has not been of value. During the early period of its use in cases in which resection was not deemed advisable or feasible, suprapubic cystotomy was carried out and the cancerous growth very vigorously fulgurated through the suprapubic opening. In all instances in which this was carried out the patients were not cured, so that we believe that this form of treatment has no value and no place in the treatment of frank carcinomata of the bladder.

CASE II.—Mrs. C. J., female, aged thirty-seven, married, referred by Dr. B. W. Sippy and Dr. Ralph Brown.

This patient complains of the following symptoms: Pain in the neck, hematuria, epigastric distress, pain in the lower abdomen and rectum, and frequency of urination. The frequency of urination began about six years ago and is just about the same now as it was when it began. There has not been much change in her symptoms. The number of times she is obliged to void at night is variable. She may go for a short period without getting up at all, and at other times she may be obliged to arise three times at night.

Hematuria.—About two years ago the patient had an attack of hematuria. This came on without any pain and without any injury. Soon after urinating, about 7.30 in the evening, the patient felt a desire to void, and upon urinating she found that the fluid was bright red in color. There was marked burning and a frequent desire thereafter. The first five or six urinations after this were very bright red and then gradually became darker and less in quantity. The catheterized specimen obtained the next day showed a very large quantity of blood-cells. Two weeks before entering the hospital the patient noticed a terminal hematuria on one occasion. At the present time there is no pain or burning on urination.

The patient has noticed on certain occasions that there is a sudden stoppage of the urinary stream. Never passed any stones or gravel.

The history of the epigastric distress, nervousness, and presence of a lump in her throat do not interest us very much, so we will pass over these points in her history.

Menstruation is negative, with the exception of shooting pains that she complained of ever since its beginning. Pain is present in the lower left abdomen during menstruation, but does not come on regularly every month.

Examination by Dr. Ralph Brown.—Head, neck, heart, and lungs are negative. Nasopharyngeal area shows no pus. Sinuses clear. Tonsils are submerged. No pus. Cheesy material in upper pole on right side.

Abdomen: Colon is palpable, otherwise negative. Reflexes O.K.

Pelvic Examination.—Body of uterus is very much enlarged, lying off toward the right side. Cervix projects toward the left and is rather soft. The uterus is movable and moderately retroflexed.

x-Ray examination for stone in the urinary tract is negative.

Examination of the blood shows 4,820,000 red cells, 9000 leukocytes, and 90 per cent. hemoglobin. Blood-pressure is 120 systolic and 80 diastolic.

Examination of urine shows specific gravity 1021, acid, trace of albumin, no casts, epithelial cells few, and leukocytes few. Cultures of urine sterile.

The problem in this case evidently is a twofold one: First, the presence of blood in the urine means the presence of organic disease somewhere in the urinary tract. Second, owing to the fact that she has a retroflexion of the uterus and that the uterus is enlarged and soft, the problem for discussion comes up as to whether or not the bladder distress was not secondary to the pathologic condition in the pelvic organs. It therefore seemed advisable to exclude any organic disease in the urinary tract to account for the presence of the blood. With this object in view we will cystoscope the patient.

Cystoscopic Examination.—This shows that the posterior wall of the bladder seems to project inward, as though pushed inward by some extravesical condition. Behind the right ureteral orifice can be seen a papillary tumor the size of a plum-stone.

We will, therefore, immediately fulgurate this patient, using, as we did in the first patient, the D'Arsenval current. Because this tumor is situated on the base of the bladder the plate will be placed under the hips. The current is now turned on and the tumor immediately becomes white, as the tumor did in the man we just fulgurated. As you see now, the entire tumor has been fulgurated and there is nothing left to suggest a papilloma except a white necrotic mass. We will instruct this patient to return for further observation in about three weeks.

In cases in which the tumor is not very large, as in this instance, certain reactions are produced in the bladder wall as the direct result of the high-frequency current, so that one cannot always tell just where the base of the tumor ends and where the edema of reaction begins. For this reason we are going to instruct this woman to come back in three weeks; at the end of this time most of this edema will have disappeared. This is important, because if one does not wait until this reaction has disappeared, one will fulgurate part of the bladder which really does not need it, and simply produce more reaction, and in this way do more harm than is really called for. This reaction should always be borne in mind, and it has come to be universally recognized as a part of fulguration. In the early days of this work it was not recognized as such, and there are instances on record in which the patients have left the doctor who fulgurated them and gone to someone else who cystoscoped them and found this peculiar condition. The second man, not knowing what had been done, interpreted this to be due to carcinoma, and patients have often been operated upon, of course, without justification. If one waits long enough until this reaction disappears and the base of the tumor is sharply defined, the treatment can be applied directly, and not infrequently after this edema has subsided there is nothing left for us to fulgurate, and so there are many advantages in not making the treatments too close together in small tumors, whereas in large tumors the patient may be fulgurated three or four times a week, at least for the first week or two.

This morning we have shown you a recurrence of a papillary tumor in the male and the presence of a new papillary tumor in the female. The early literature, as you know, was very interesting on the relation of the occurrence of papillary tumors to the sexes. It was set down as exceedingly rare to find papillary tumors in women. Since the advent of careful work in genito-urinary surgery this old dogma has been completely disproved. Our own experience has been that papillomata occur in women in about 30 per cent. of all cases. When I make this statement I refer to the simple benign papillomata.

In summing up the present status of the question of the treatment of benign papillomata of the bladder one may say:

1. The fulguration treatment is without danger in the hands of those who are competent to carry it out.
2. The percentage of recurrences are decidedly less with this form of treatment than with open operation.
3. This form of treatment can be carried out in an ambulatory sort of a way, so that the patients spend only a day in the hospital. They are not obliged to take an anesthetic and they are spared the long convalescence that is always a part of the suprapubic operation.
4. While the mortality rate of suprapubic operation for papillary tumors is low, nevertheless there is a definite mortality with this form of treatment, which mortality is completely eliminated by the employment of fulguration.
5. It leads to a more careful postoperative study of our cases. These patients are more closely observed than they were before.
6. It has stimulated more universal microscopic study of these bladder tumors.

FULGURATION TREATMENT OF URETHRAL CARUNCLE

Summary: Fulguration versus operation; technic; results in case demonstrated.

Urethral caruncle is of rather frequent occurrence, and is generally treated by operative removal of the caruncle, a procedure which in itself can be carried out under local anesthesia and has always been regarded as a minor procedure. Recently, however, we have given up the idea of operative removal of urethral caruncle and have treated all caruncles that we have seen by means of the high-frequency current, a procedure which is very simple, very efficacious, and one that has rendered us very good service in the treatment of this condition.

The patient that we have for treatment this morning is Mrs. F. O. S., aged sixty-two, married, and the mother of seven children.

Present Complaint.—One day she noticed that a few drops of blood were flowing from her genital organs. Examination of her underwear showed it was blood-stained. This discharge of blood occurred twice at intervals of a number of days. The second hemorrhage was more severe than the first. There were no urinary symptoms.

Examination.—General examination is negative and pelvic examination is negative.

The external urethral orifice shows the presence of a caruncle, about the size of a large bean, situated at the lower margin of the external urethral orifice (Fig. 272).

By means of this large electrode we will apply the D'Arsonval current and fulgurate this caruncle. As you see, this takes but a few seconds, and the entire caruncle has been converted into a necrotic mass (Fig. 272, *A*). We shall ask the patient to come back for observation in about ten days. If the caruncle has not been completely destroyed by this form of treatment, another treatment can be applied.

Postscript.—The patient came back to the hospital in ten days, and examination showed complete disappearance of the caruncle.

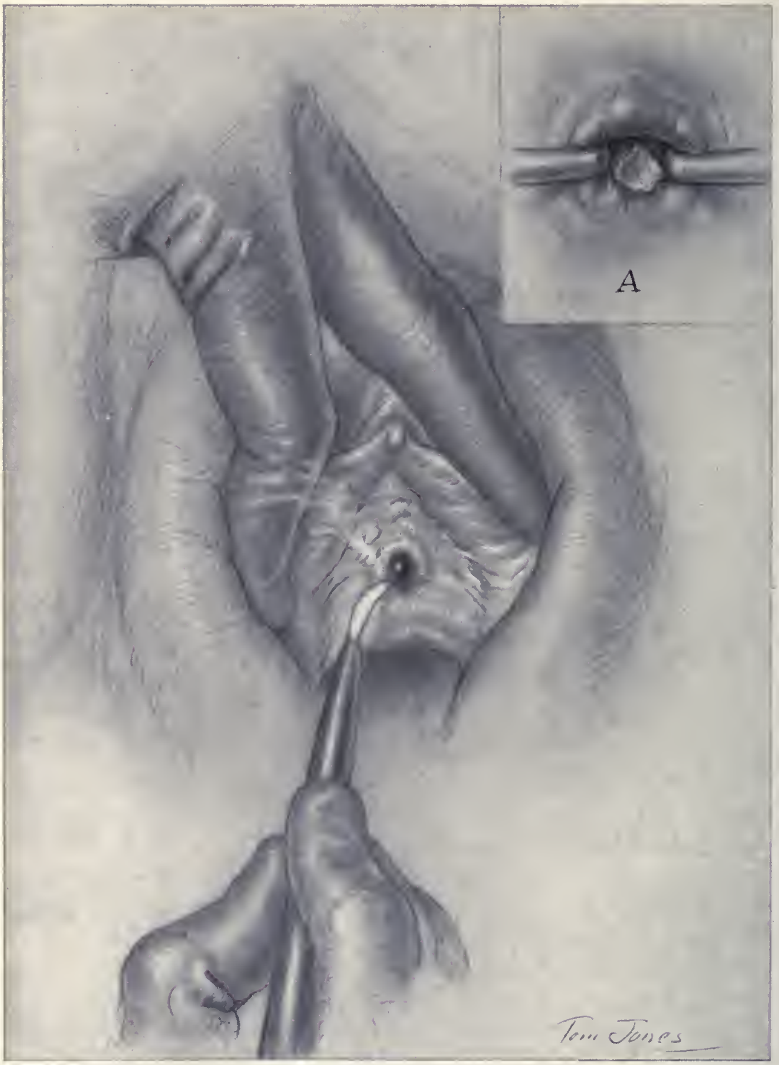


Fig. 272.—Fulguration of caruncle; labia separated by fingers of left hand. Insert *A*. Appearance of lesion at conclusion of treatment. Note its white corded surface.

In its stead was seen a large ulcer which had been produced by fulguration. Later examination showed this completely healed.

CLINIC OF DR. WILLIAM HESSERT

ALEXIAN BROTHERS HOSPITAL

A SURGICAL CLINIC ON FRACTURES[1]

Summary: Transverse fracture of the shaft of the humerus with musculospiral paralysis; remarks on Colles' fracture; oblique fracture of shaft of the right humerus with musculospiral paralysis; acute osteomyelitis of the left tibia; avulsion of the quadriceps tendon above the patella; spiral fracture of the tibia; spiral fracture of the tibia and fibula; fracture of the os calcis; comminuted fracture of the neck of the femur; spiral fracture of the femur; fracture of the neck of the femur; impacted fracture of the neck of the femur; compound comminuted fracture of tibia and fibula; fracture of the neck of the femur; Pott's fracture.

I FEEL greatly honored to have the privilege of speaking to you this afternoon and of showing you a few of our cases. This will be mostly a show clinic. I have requested some of my out-patients whom I am treating for fracture to be present today, and with them and the cases we have at present in the hospital the clinical material ought to be interesting and instructive to you.

We have a great deal of emergency surgery in this hospital. We have considerable bone work and fractures of all kinds to deal with, as you will see. Every one of the patients will teach us some lesson, and I will try and frame my remarks in such a way to point out the lesson that case has taught me and I trust will teach you.

The first patient (Case I) consented to come in from Bartlett, Illinois, to be shown for your benefit. I will first demonstrate an old injury to the arm, which shows a late result after fracture of the humerus with musculospiral paralysis. A number of years ago this man sustained a transverse fracture of the shaft of the humerus at about the middle, complicated with musculospiral paralysis. The first thing you have to do in a case of fracture of the shaft of the humerus, after determining the existence of a fracture, is to find out whether or not there is wrist-drop, meaning involvement of the musculospiral nerve. In civil practice that is of extreme importance as well as in military practice. It is of paramount importance to know whether the paralysis is primary or secondary, as it makes a great difference in the subsequent treatment and prognosis. Paralysis of the musculospiral nerve associated with fracture of the shaft of the humerus is of two kinds—primary and secondary. Primary paralysis usually occurs immediately on receipt of the injury, and is due to a complete and immediate division of conductivity of the nerve. There is either complete severance of the nerve or such a severe contusion with partial division as to cut off the conductivity, and you get immediate paralysis of the forearm extensors. We have secondary paralysis that occurs after a week or ten days, or longer. The paralysis is not due to a complete and immediate severance of the nerve, but to a pressure that gradually develops with the formation of callus, the consolidation of blood-clot, the pressure produced by unreduced bony fragments, or improperly applied splints. Its onset is more slow than that of the primary paralysis.

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[1] Delivered before military surgeons, Alexian Brothers Hospital, March 20, 1918.

Suppose a patient presents himself a few days after the fracture was sustained, and you find he has a wrist-drop; if you do not know whether it is a primary or secondary condition, it is going to be impossible to institute the proper treatment. *Primary paralysis demands immediate operation.* That is my personal conviction. I do not believe you get this sufficiently emphasized in text-books. Everything I tell you today is my own opinion based on my own experience, and you can take it as such for what it is worth. Secondary paralysis gives hope of recovery without operation. That is a very important point for you to keep clearly in mind, because if you allow a case with primary paralysis to go for a month or two, or longer, and there is no improvement, you will have to operate anyway, with the chances not as good as they were at first. What is the use of operating on a nerve that you know will recover after three or four months or more? But how do you know whether it is going to recover or not without operation? That is the crux of the whole question. If there is one point I want to impress upon you it is this: *You must make the earliest possible diagnosis of the condition as to its being primary or secondary*, and you do that by examining in a routine manner for paralysis of the nerve at the time you first see the fracture.

This man had primary wrist-drop, due, as it was later disclosed, to a complete division of the nerve. I cut down on the fracture within the first week and sutured the nerve. He was operated on before the days of Lane plates and Parham-Martin bands. I wired the humerus, with complete operative and functional recovery. Here is the important thing in making a prognosis: It takes from eight to twelve months for a nerve to recover its function after division when it is sutured. That is a long time. We have another man here who is just about well after nine months. The first patient's arm is perfectly well now and strong. The patient says it is as good as ever. This happened eleven years ago. That is not what he is here for today. He is here for another condition, but I was glad the opportunity presented itself of showing the ultimate result of a nerve suture. It was about a year ago last September that he fell and sustained a Colles fracture, which was reduced by a local doctor, and two months later he came here on account of great deformity. Function was not good, and having in mind to improve both the cosmetic and functional result, I operated. That was in December, 1916.

With chisel and saw the radius was divided, the section beginning above, several inches above the tip of the styloid process, and extending downward and to the ulnar side. The idea was to correct both the radial inversion deformity and lengthen the bone. Great difficulty was encountered when it came to fixation of the fragments. Finally an intramedullary ivory peg was employed. One end of the peg rested in the medullary cavity of the upper fragment, and the lower end was fixed in a groove on the lower fragment. This arrangement seemed to work very well at the time and held the fragments in good position. The wound healed without infection, but, to my great disappointment, there seemed no inclination toward union. Week after week the wrist was anxiously examined, but while the position at first remained correct, the bones would not unite firmly. After wearing the splints two months the patient insisted upon their removal, and a leather wrist support was worn. The man now began to work with the injured arm, with the result that from month to month a deformity developed, which was at first slight, but after six months became very marked

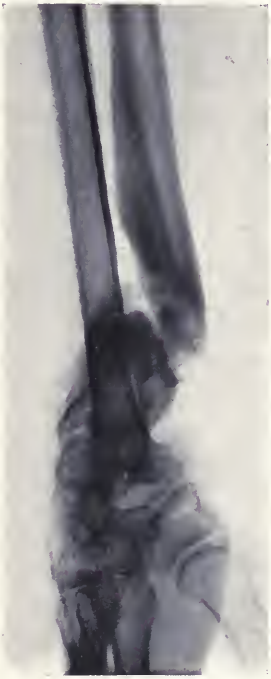

Fig. 273.

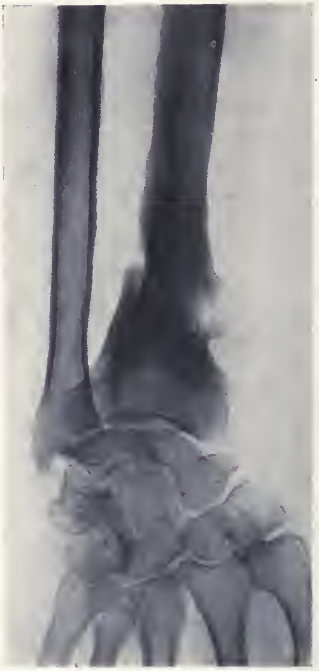

Fig. 274.

Fig. 273.—Ununited fracture of radius showing great deformity and ivory peg slipped up in medullary cavity of upper fragment.

Fig. 274.—Anterposterior view does not reveal the extent of deformity. Note altered relation of lower end of radius and ulna. Ivory peg is seen dimly.

(Fig. 273). The deformity, pain, and disability finally became such as to demand correction, so I decided to operate upon him again. The second operation was performed December 28, 1917, as follows:

The seat of fracture was exposed and the deformity corrected. The ends of the fragments were freshened, but, first of all, I started to remove the ivory peg. This was not as easy as you might imagine, for the peg had slipped way up in the medullary cavity, and the more you tried to grasp it, the higher up it slipped. It was finally necessary to open the medullary cavity before the peg was recovered in pieces. This gutter, together with a similar one on the outer side of the radius, lent itself nicely in forming a snug bed for a bone inlay taken from the tibia. The graft was held firmly in place by means of wires, making a very fine reconstruction of what was a very bad situation (Fig. 275). The wound healed nicely, and now, three months after the operation, I present the result. The dorsal deformity has been corrected absolutely and the member is just as straight as it can be. The radial deformity has been largely corrected, but not entirely so, but it is about as well as it can be. The union is very firm, and motion at the wrist is free and improving all the time. I expect much better motion than he has now as time goes on. He is now doing a lot of things with it. He is a farmer by occupation. He is unable to milk with it at present, but milking is the finest exercise for this patient. Pronation is good, but supination is somewhat limited as yet. This small swelling in the palmar surface is due to a little bit of callus and bone which you see in the *x*-ray picture (Fig. 275). That does not mean a deformity. That piece I did not take out at the time of operation; I left it in there to give strength. We have overcome the radial displacement and have overcome the dorsal deformity as you see. His grip is fairly good. Look at this unsightly deformity (Fig. 273), with the peg away up in the medullary cavity, a bad condition of affairs. Nothing could be done as long as that peg was in place. It was a foreign body and as such it unquestionably was the direct cause of non-union. One thing that shows up nicely is a rarefying osteitis that you always find after two or three months or four or five months where there has been disuse of the limb. This condition corrects itself after the member begins to be used again. These bones are all rarefied. The region of the wrist-joint is rarefied, the calcium salts having been partially absorbed as a result of disuse. In such cases normal conditions of density are quickly restored when function is resumed. We have good bony union there now. There is good consolidation, and his function is

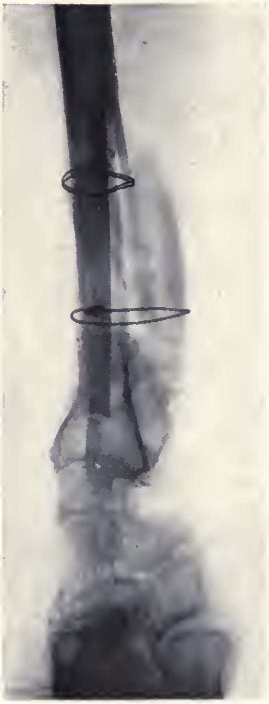

Fig. 275.

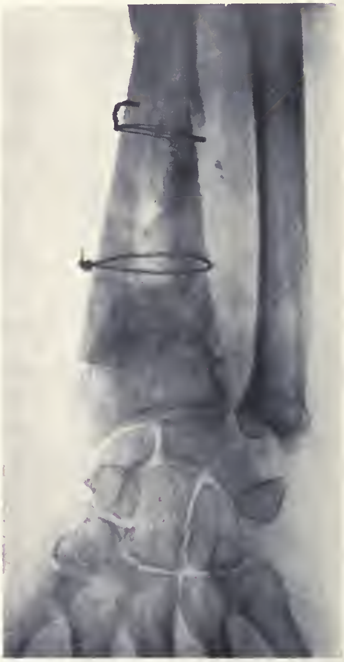

Fig. 276.

Fig. 275.—The lower wire includes a piece of radius loosened at time of operation. The longitudinal axis of the shaft has been restored. The outlines of the graft are clearly discernible.

Fig. 276.—Note how strongly the bone has been fortified by the inlay. The lower ends of radius and ulna have resumed a more normal relative position. The ivory peg has been removed. (Compare Fig. 274.)

90 per cent. better than before the operation. Yes, it is all of that. I think his function is going to be 90 to 95 per cent., whereas the other way he was absolutely disabled.

Let me make a few remarks about Colles' fracture. In the first place, with reference to operating on Colles' fracture, where the cosmetic result is not as good as it might be, I should say, "Don't do it." I will never do it again in a similar case. We see Colles' fractures with atrocious results from a cosmetic standpoint, but with perfect function. Now, unless there is a very good and valid reason cosmetically or otherwise for operating I would not operate in such cases. The disability following a Colles fracture is not the result of bony displacement as much as the result of improper treatment. Too long immobilization with the fingers extended; that is to say, leaving the splints on too long, will give you more disability afterward than a fracture that is not treated at all. I do not know whether I make myself clear or not, but you can have a Colles fracture after six weeks still showing enormous radial and backward displacement, with perfect function. Why should we operate unless we do so for cosmetic reasons? Bear in mind it is a difficult job to correct a badly united Colles' fracture, and if you are wise you will let the patient alone if he has good function. My advice is not to touch it. That is my conviction. If you have such a case in a woman who absolutely wants the thing corrected, it is a different thing. Don't do it on account of impaired function, because impaired function is not the result of malposition, as we see the very worst malpositions with good function. We see fractures properly reduced cosmetically with terrible deformity of the hand and disability for months and months. Why? Because, in the first place, the doctor may have put on a plaster cast from the elbow to the finger-tips and left it on a month or six weeks. If you want to produce a half-year's disability, do that. Bad contracture and stiffening are the result, which will take months of massage and passive motion to clear up. Keeping splints on too long and putting them on too tightly will do the same thing, even after the most perfect reduction. The functional disability is a result of improper treatment, so that we know when a Colles fracture is properly reduced, ninety-nine times out of a hundred it will stay reduced. With the application of anteroposterior splints, leaving the fingers free, so that muscular activity is not impeded, patients with these fractures will make uninterrupted cosmetic and functional recoveries.

Stiffness of the fingers following a Colles fracture is the result of a myositis, the result of pressure by splints or too long immobilization. An extreme condition of this kind is Volkmann's contracture or ischemic paralysis. This is the result of too tight bandaging and is a grave calamity to have happen. I don't believe that the general profession quite realizes this question, and that it may take only two, three, or four days of constriction to be followed by the most disastrous results. A fibrous degeneration of the forearm muscles takes place and the process does not stop until the hand is converted into an almost useless claw. It is only after tedious orthopedic treatment or operation that function is restored.

It is a mistake, in the next place, to put in a foreign body such as ivory. I am getting away from that sort of thing. I will never use ivory again or any kind of foreign material in the medullary cavity of bone. I have done it time and again, and I have generally regretted it. I have used ivory and composition of one kind and another in the medullary cavity, and I cannot say it is satisfactory. The use of metallic bodies, like the Lane plate, on the outer side of live bone in the treatment of fractures is bad enough, as I will show you today, and we are getting away from that also. Such metallic devices are unnecessary evils and are fast being supplanted by autogenous bone-grafts. Don't put anything inside the medullary cavity of bone except it is an autogenous bone-graft or bone-inlay. This ivory peg was a foreign body. It did not serve its purpose. It prevented union; it slipped up in the medullary cavity, and the member became more and more deformed every week, but it taught me the lesson not to put any foreign body in the medullary cavity unless it is a bone-graft or bone-inlay, as I have previously remarked. Those are the points I wish to impress upon you in regard to this case. I am getting more conservative all the time as regards operations on fractures. We have survived the furore which came with the Lane plate, and have learned by experience to demand that certain indications be fulfilled before advising operation. The first indication is that every other possible method of reduction has been tried and has failed to secure satisfactory reduction. A little displacement is of no moment when, in our experience, function will be restored. Aside from the danger of wound infection, one of the greatest drawbacks of the Lane plate and similar devices which hold the fragments immovable is delayed union. I always allow about one-third longer than the normal period for consolidation in Lane plate cases. I have seen many, all clean cases, in which firm union was delayed for many months until the plate was removed, whereupon, with use of the limb, consolidation rapidly occurred. An inlay, while it keeps the fragments in line, does not hold them as immovably as a Lane plate, and for this reason does not interfere with union, which, as Lucas Championiere said long ago, requires a certain amount of motion to acquire firmness.

Case II.—This man came so that I might show him and talk on the question of musculospiral paralysis, but I got started on this subject with the other case and may not be able to spend much time on him. In 1916, a year ago last December, this man was here with a spiral fracture of the shaft of the right humerus, with an immediate musculospiral paralysis. It is important to know, as I said before, whether a man develops paralysis immediately after injury or after the splint has been on two or three days or longer. This patient noticed it at once and so did the intern. The important question always to determine is, Was it immediate or secondary? It is of vast importance also from a medicolegal standpoint, as these cases may get into court, the doctor's splints being blamed for the paralysis. The doctor might endure great embarrassment and a verdict for the plaintiff if he did not know whether the paralysis was there or not before he began treatment. You want to be in a position to say that this will or will not get well without interference. You want to be in a position to say if the paralysis is secondary or not, and whether the patient under the use of electricity and massage, and so on, will, after three or four months, get better without an operation. If you do not know whether the paralysis is primary or secondary you have nothing to base any opinion on, and you cannot do the proper thing for the patient. At any rate, you are assuming an awful risk. After a week I operated on this patient, but this time I used a Parham-Martin band. I suppose you know what a Parham-Martin band is. I do not happen to have one here at this time. It is a neat contrivance. It is a metallic band which is carried around the bone and clamped, holding the fragments very efficiently. It is a very neat thing to use in spiral fractures. You cannot use it in transverse fractures. I will show you what it looks like in another case, one of fracture of the tibia. This band was put on in this case and the after-treatment was uneventful. Here again, it is interesting to notice how long it takes for recovery. The nerve was not completely severed in this case, but had to be sutured. It never would have gotten well without operation. The treatment of the bone is secondary to that of the nerve. I should have treated the bone conservatively if it were not for the nerve injury.

I believe that all fractures of the humerus associated with immediate musculospiral paralysis should be operated on. It took eight months before this man had complete use of the hand. It takes eight or nine months or a year before function is completely restored. The neurones or axis-cylinders grow out from the proximal portion of the old nerve until they reach the periphery. Can we have a contusion of the nerve that will cause paralysis? Yes, I have had such cases, and I have cut down on the nerve in a few instances. What is the object of waiting weeks or months for improvement? You get much better results in both the fracture and the nerve by operating, and killing two birds with one stone. I would rather cut down early and find the nerve only contused, than wait for improvement in vain and have to do a late operation anyway. After you have made up your mind that you have to operate, I would do so right away if I have the indication. The paralysis is due to external violence applied at the time of injury; bones are broken and separated, and the nerve is closely associated with the bone as it passes around in the musculospiral groove.

QUESTION: How do you splint a Colles fracture?

DR. HESSERT: The main thing is *reduction*. After you have reduced a Colles fracture, some go so far as not to put on any splint at all. I would not do that. If the fracture is properly reduced, I personally would treat it with anteroposterior wooden splints, running the posterior splint from the head of the radius to the metacarpal phalangeal junction, and the anterior one sufficiently short, giving the patient free motion of the thumb and fingers. I keep the splints on, all told, for two or three weeks, not over three, taking them off in the meantime half a dozen times in order to keep up passive motion and massage. You must pad the splints with sheet cotton sufficiently, strap each one on individually with adhesive plaster, and do not employ too much pressure. The splints should not cause pain. For the first four or five days examine the arm daily. Motion of the fingers should be free and not painful.

CASE III.—This boy has an interesting history. He was under my care seven years ago with acute osteomyelitis. A complete history of this case together with x-ray pictures, also a description of an arthroplasty, has already appeared in the Surgical Clinics,[1] so I will not go into very much detail regarding his case.

He had acute osteomyelitis of the tibia in 1910, resulting in the loss of the entire diaphysis of the bone, which became necrotic, and was removed. Here is a picture of the shaft after it was taken out. I have treated these cases of acute osteomyelitis side by side, taking out the shaft in one case, and leaving it in in the other. I will say that those treated conservatively, while taking longer to recover, presented quite as good end-results as those in which the whole or part of the shaft had been removed. There was complete regeneration and everything went along nicely. The only trouble we had here was one of those rare complications, involvement of the joint in acute osteomyelitis. In the great majority of cases of osteomyelitis, of the shaft of the tibia, we will say, the knee-joint is not involved, but it was involved here. The infection spread to and around the joint, and, to make a long story short, it left this boy with an absolute bony ankylosis of the left knee at an angle about like this (indicating), so that he was walking in that way at an angle of 120 degrees, absolutely stiff and rigid, as is shown in these pictures, which give you an anterior and lateral view. I was determined to do something for the boy, as he was incapacitated physically. I planned an arthroplasty, hoping to get more or less motion in that knee-joint. An arthroplasty of the knee is about as difficult a job as one can tackle in the whole domain of surgery. It is one of the toughest propositions imaginable—I mean where there is complete bony ankylosis. The hip- or elbow-joint is not in it with the knee. If any one does much of this kind of surgical work it will drive him to an early grave.

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[1] Surgical Clinics of Chicago, February, 1918, p. 129.

In the first place, you see by the pictures that he had absolute bony ankylosis. I will describe briefly what was done. I cut down on either side longitudinally, loosened up the flaps, loosened up the patella, made two flaps with the convexity upward, reshaped the ends of the bones, the femur and the end of the tibia. I made two depressions in the tibia for the newly formed condyles of the femur, and turned the patella completely around. Not having put on a constrictor, there was a great deal of bleeding, but not enough to obscure the different steps of the operation. The operation took a little over two hours to perform. When the flaps were brought over the tibia they overlapped for quite a distance. When I was through with the operation I could move the knee very well to a right angle. I could straighten it easily and bend it to a right angle. It was drained, and healing by primary union took place. Some time after he left the hospital he developed a small abscess under the skin which had nothing to do with the knee-joint. The difficult proposition here was to make a joint not only approximately normal, but to *make it weight-bearing*, keeping the leg in line. I leave it to your judgment to say how much this boy has been benefited. He is satisfied with the result because he can walk freely, without support, with his leg straight. The plastic operation was done on July 19, 1917. You will notice that there is no lateral instability. There is no wobbling. The joint is weight-bearing, which is one of the conditions we strive for. I am satisfied with the condition. I am not quite satisfied with the mobility, but I am glad to hear that Dr. Ridlon, who is present this afternoon, considers it a good result. I would like the boy to get more motion, and I think he will as time goes on. Is it not remarkable that, although we destroyed the lateral and crucial ligaments, the knee does not wobble laterally? This is due to keeping the axis of the leg straight—keeping the limb plumb. It is almost as firm as the other leg. I will show you *x*-ray pictures that were taken a month or two after the operation—I think about six weeks—showing the way in which the tibia was shaped and fashioned to accommodate the condyles of the femur. Here you see a lateral view. I was afraid of this region for various reasons; in fact, I did not sleep that night, and I will tell you why. I did not know the condition of the external popliteal nerve, and I did not know whether the boy was going to develop gangrene of the leg or not. When I saw the boy the next day and felt of his toes they were nice and warm. Motion was there, and a big load was taken off of my mind. The external popliteal nerve had been exposed and I felt sure I had not injured it, but we can never tell. We should be afraid of the circulation for the simple reason that here was a limb which was in a bent condition for years, and you never can tell what will happen when you straighten it. If I had cut the external popliteal nerve the patient would have been worse off than before. If we had impaired circulation it might have meant amputation. You see how important it is, and I think Dr. Ridlon will bear me out in saying that when a surgeon operates on an ankylosed knee-joint he will not be able to sleep that night nor rest until he sees the patient the next morning. The result in this case conforms to the requirements of arthroplasty of the knee inasmuch as it is weight-bearing. The shoulder and elbow do not have to be weight-bearing. The knee must be weight-bearing to be a good job. If one cannot bear weight on the knee afterward, in spite of free motion, what good is it? It is better stiff. I have known surgeons to stiffen them again after arthroplasties to enable these patients to walk.

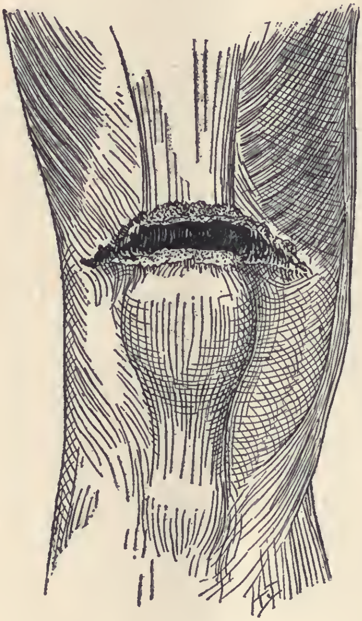

Fig. 277.

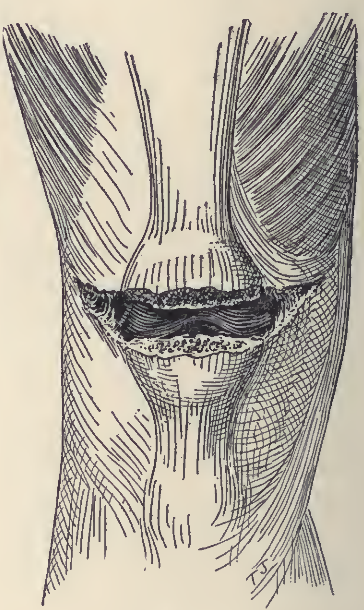

Fig. 278.

Fig. 277.—Rupture of the quadriceps above the patella.
Fig. 278.—Transverse fracture of the patella with lateral laceration of the capsule and aponeurosis of quadriceps extensor.

Case IV.—The next patient illustrates a condition that forms one of the types of injury of the extensor apparatus of the knee-joint. I believe in classifying injuries in the neighborhood of the knee-joint not into fractures of the patella, or to put fractures of the patella in the foreground, but to consider the whole mechanism. In the first place, we may get an avulsion or separation of the extensor tendon above the patella. I have had cases of this type here, with tearing off of the quadriceps extensor tendon, leaving the patella intact (Fig. 277). There is a transverse laceration above the patella absolutely disabling the patient. The crucial test in such a case is this: The patient lying in bed, with leg extended, is not able to lift the leg off the bed in the extended position with any of these injuries, unless it is a fracture of the patella without any injury of the lateral aponeurosis. A suprapatellar laceration of the extensor tendon is a very serious, disabling injury which cannot be treated conservatively. It requires accurate suturing. Next we have the most common injury in this region, the so-called fracture of the patella (Fig. 278). Fracture of this sesamoid bone, called the patella, is, as a rule, the least part of the general injury. A simple transverse fracture of the patella without any

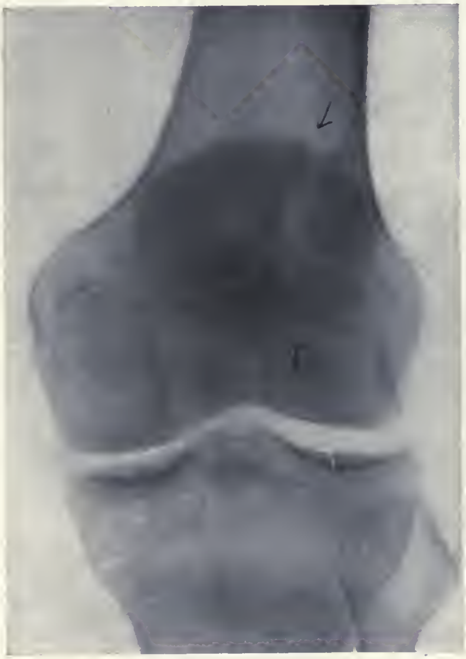

Fig. 279.—Longitudinal fracture of the patella. The longitudinal light streak between the arrows is the fracture.

laceration of the lateral capsule, the fascia and lateral extension of the quadriceps tendon, is not a severe disabling injury, and can be treated conservatively because the extensor apparatus is not impaired. You can get along without a patella. The patella has been removed for tuberculosis and other conditions, and the functional result has been good, so that if the fascial apparatus is intact, the mere fact of the patella being fractured is not such an awfully important thing.

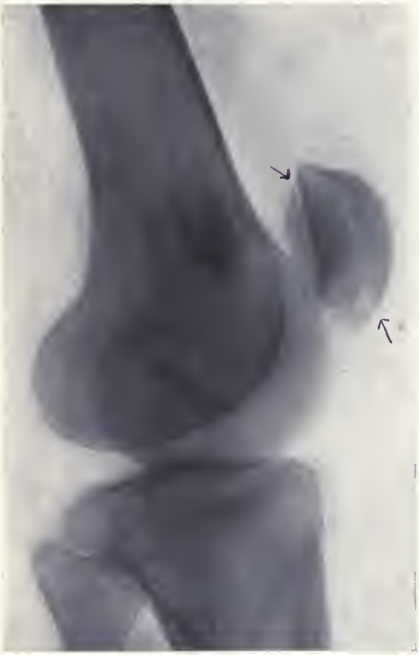

Fig. 280.

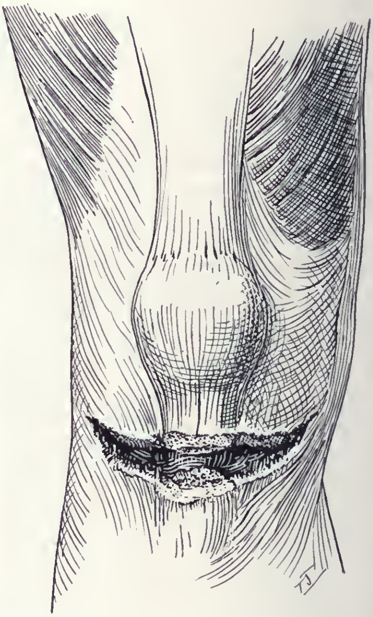

Fig. 281.

Fig. 280.—Longitudinal fracture of the patella.

Fig. 281.—Avulsion of the ligamentum patellæ. The ligament usually carries with it a small bit of bone. The lateral lacerations vary in extent, but are usually extensive on both sides.

I will show you in this connection a longitudinal fracture of the patella (Figs. 279 and 280). Speaking of fractures of the patella, in the majority of cases they are transverse. Rarely we get a longitudinal fracture of the patella. I have an *x*-ray picture of such a case which was caused by direct violence. There was no functional disability. The patient was able to lift the leg off the table and got well without operation. But those are rare cases. The important thing about the so-called "fracture of the patella" is the lateral laceration of the capsule, and in an operation for fracture of the patella the important thing is to repair this lateral laceration, much more so than to repair the patella itself. Before the days of aseptic surgery it was customary to throw a ligature or suture around the patella subcutaneously and not consider the lateral laceration as very important.

Finally, we come to this case, which is an avulsion of the ligamentum patellæ from the tibial tubercle (Figs. 281 and 282). I have asked this man what he was doing at the time he was hurt. He said he slipped and fell, and in an endeavor to save himself enormous muscular strain was applied, with the patella as a fulcrum. If it does not break the patella, or the tissues do not tear off above the patella, it may give way below, as it did in this case. He came in with an enormous hematoma involving the knee-joint. He was unable to raise the leg off the bed. The patella was not fractured, but I could palpate the separation of the tissues below the patella. As operation is the only proper treatment, this was done. Sometimes I turn a flap up and sometimes I turn it down. In some cases, where the convexity of the flap was upward, we have had a little necrosis of the edge of the flap, so that in the majority of cases I have the convexity of the flap downward. There is no objection to the scar being in front of the knee; at least, I have never found any. The flap is turned back, and the proposition to deal with is one of fixing the ligamentum patellæ to the bone. The lateral capsule was torn extensively in this case. It is easy enough to sew up the capsule, but how can you fasten the ligament? The ligament cannot be sutured to the bone, the only thing to do is to nail it, and that is what we did here with a couple of wire nails. These little shadows you see in the x-ray picture represent little spicules of bone torn off from the tibia (Fig. 282). That is a lateral view. I now show you an anterior view. The patient was operated on August 23, 1917. I have asked him what he can do with that knee, and whether he can walk upstairs without taking one step at a time, and he says he can. The result here has been very good, and it typifies one of three main accidents that involve the extensor apparatus, avulsion of the ligamentum patellæ. When these tendons tear off, they tear off a small portion of the bone on the order of a sprain fracture. The postoperative treatment of all of these cases is the same. After ten days' or two weeks' immobilization, the leg is kept in a posterior splint, which is removed every day or two for the purpose of making passive motion and massage. The patient walks on the leg after the third week, and from this time on an elastic support is worn

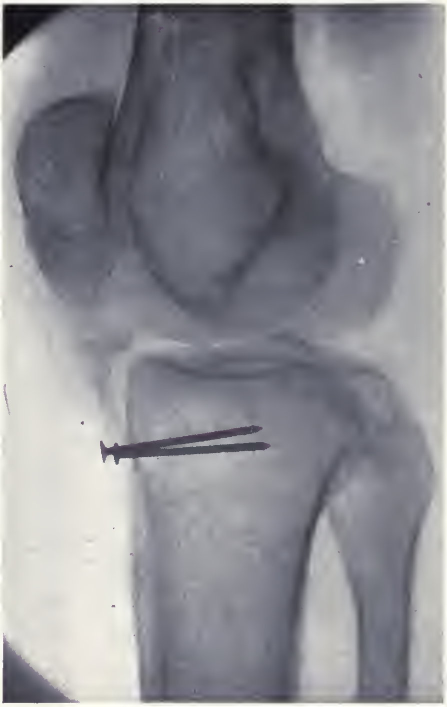

Fig. 282.—Avulsion of the ligamentum patellæ. Ligament nailed to tibia.

and moderate active and passive motion indulged in. It is a great mistake to immobilize too long, say six or eight weeks. This prolongs the disability for months, and some of these patients never regain as free motion as they would with the other system. Passive motion should always be gentle; rough treatment does more harm than good.

CASE V.—Here is a patient who was injured October 31, 1917, and his case brings up a number of points in the treatment of fractures of the leg. He comes in with a spiral fracture of the tibia (Figs. 283 and 284). He was hurt in carrying in a bag of coal. He slipped, fell, and twisted the leg right around. In such a case as this always take two views. That may be an elementary thing to bring up before a body of gentlemen like yourselves, but if anybody asks you to give your opinion in such a case with only one plate, don't give it. You want two views always of every fracture, unless it is a fracture of the hip or a fracture of the skull. But in a fracture of one of the extremities don't base an opinion on one view only. You must have two views. I have been very much puzzled at times by having only one view. One would think that the bones were in ideal apposition until he sees the other view taken at right angles. You can fool a jury or anybody with that picture of this leg (Fig. 284). As I have said, this may seem to you an elementary point, but I urge you not to base your opinion on one view alone, as you will get yourselves into trouble if you do.

We did here what we always do with these cases. The patient was put on a Hawley table, extension applied, and while extension was on and the man was asleep a cast was put on. We did this with this spiral fracture, and, you know, we have right-handed spirals and left-handed spirals. If a man jumps off a car and turns in this manner to the right (illustrating) it is a right-handed spiral, and the other one is a left-handed spiral. You can tell from the character of the fracture how this man was hurt, more or less. After the man had been anesthetized with the limb extended, an attempt at reduction was made, and that was the result (Fig. 285). It cannot stay like that. We have tried conservative means and have been unsuccessful. So

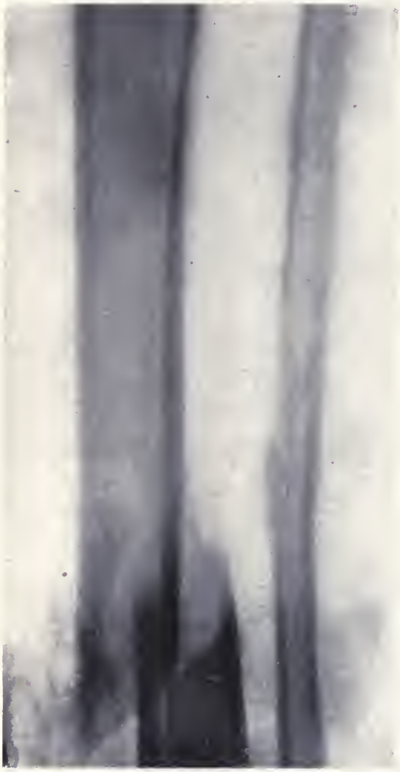

Fig. 283.

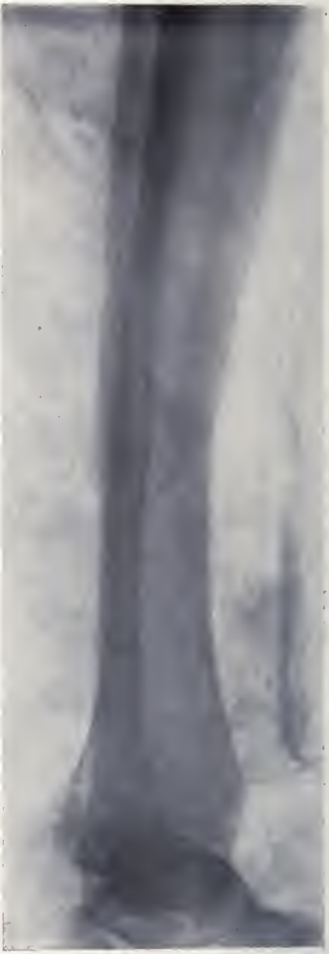

Fig. 284.

Fig. 283.—Spiral fracture of tibia. Radiogram taken through cast after attempt at reduction under anesthetic and use of Hawley table. The fragments, owing to their oblique line of contact, are prone to skid by one another, producing a longitudinal and lateral displacement. The sharp ends are very apt to be speared into the soft parts. This is a type of fracture that commonly requires open reduction.

Fig. 284.—Lateral view, while it shows the axis of limb to be correct, gives no evidence whatever regarding the type of fracture or the amount of displacement. Exemplifies the necessity of two views.

in a case like this we advise the patient to submit to operation, and when it comes to operating on fractures of the leg I will show you one case later where I used an inlay. You can get

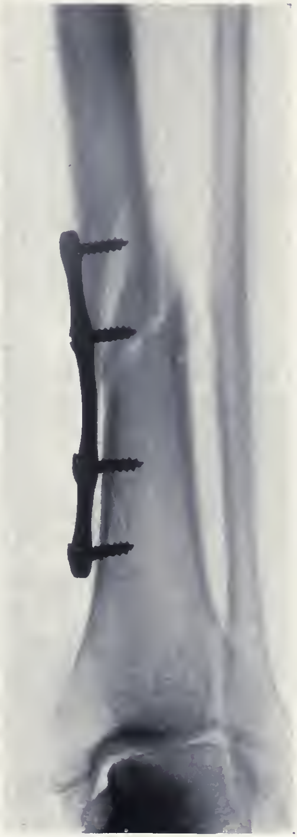

Fig. 285.

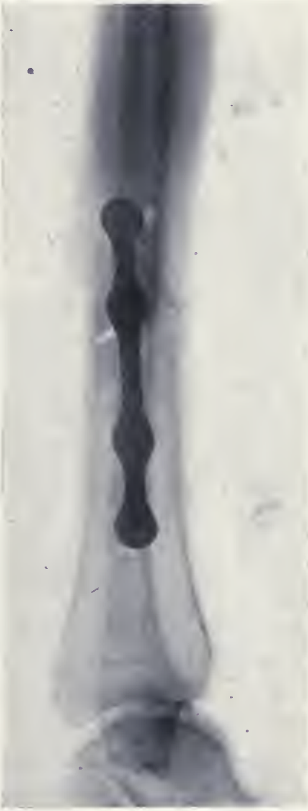

Fig. 286.

Fig. 285.—Fixation with Lane plate. Approximation is not perfect, there is still a slight displacement. The plate is heavier than necessary, but happened to be the only one available.

Fig. 286.—Lateral view.

the most accurate mechanical results with a Lane plate, but I do not like it better than an inlay. The plate is much quicker of application. I will show you another patient on whom I did an inlay. There is the least bit of displacement here (Fig. 286) and the result is not what you call ideal. I am not showing him on that account, but on account of what followed later. I refer to delayed union. That is something we have to reckon with in our Lane plate operations. This wound healed by primary union and things went along very nicely for about three months. The cast was on for two months and union then seemed firm. After three months, however, the plate was still in place, but the thing wobbled. I took out the plate under local anesthesia; it had to come out because the union was not firm. I put the leg in a plaster corset and let him walk on it. I believe Lane insists that if we do not get union in these cases it is due to infection. But it is not infection. This case healed up clean from beginning to end, yet we have delayed union, but as soon as weight-bearing function is established and the foreign body is out the union becomes firm. It is firm enough now. I am allowing the man to walk around, and union is going to be absolutely firm. There is one of the drawbacks of the Lane plate or any other device that holds the bones immovably. I don't care very much about the bone-plate. A great deal has been said about the benefits of the bone-plate owing to its being absorbable, but it has all the faults of the Lane plate, in that there is danger of infection, and absorbability, to my mind, does not count for very much. I do not know how you gentlemen feel about it. The principle is the same. If the Lane plate is bad, the bone-plate is bad. The bone-plate is much harder to put in, and you cannot do as nice a job with a thick bone-plate as you can with the Lane plate. If you decide to use foreign material in these cases, use metal. The nicest thing in cases of this kind is an inlay, but with an inlay you cannot get as accurate apposition in oblique fractures as you can in transverse. You can get good coaptation for all practical purposes, and you get better union than with the Lane plates, and I have been using Lane plates ever since they came out. The more experience I have, the more conservative I become. I will try everything first before I operate. We have been carried along the crest of the wave of popularity of the Lane plate and much harm has been done by its use. Operations have been performed by men who are not qualified, and patients are walking around with deformities and sinuses who never should have been operated by men incompetent to do the operation. It happens once or twice a year that we have trouble here with such cases. Speaking of infection, I will show you what happens. During the time I operated on the man whose pictures I will show you, there was a change in the intern and operating-room service, and it seemed as though almost every case I operated on that week became

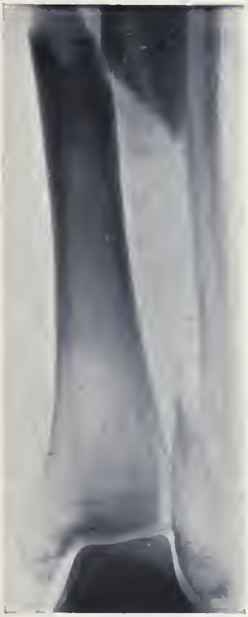
Fig. 287.

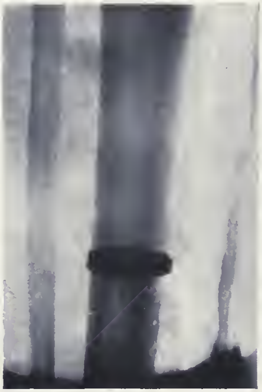
Fig. 288.

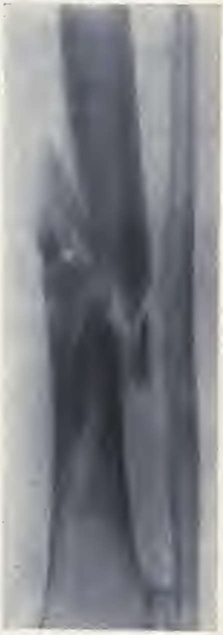
Fig. 289.

Fig. 287.—Spiral fracture of the tibia and oblique fracture of the fibula. Considerable overriding and lateral displacement. Irreducible. Some deformity persisted after attempts at reduction.

Fig. 288.—Same as Fig. 287 after reduction and application of Parham-Martin band. Perfect reduction.

Fig. 289.—After infection and removal of band two months later. Displacement has recurred. The sharp ends of the bones are becoming necrotic.

infected, yet I felt it was not my fault. Other men had infections. What happens to these operative cases when they become infected?

Case VI.—Here is a case of spiral fracture of the tibia (Fig. 287). We did the same thing in his case as we did in the previous one. We had an *x*-ray taken with the patient on a Hawley table under an anesthetic. Here is the next picture, showing the result after operation (Fig. 288). Everything went along beautifully; the Parham-Martin band is in place and the result is absolutely ideal. After a week infection supervened, and after a couple of weeks the Parham-Martin band had to come out (Fig. 289). The whole thing opened up and started that long and tedious course of osteomyelitis and necrosis and sequestration, now going on for over a year (Figs. 289 and 290). He was hurt nearly a year ago. He has a leg corset on, he walks fairly well, and has very little deformity. He has a few sinuses, but the end-result is quite good. But think of the disability for a whole year! Think of what that means economically and to the insurance company that is paying his weekly indemnity. Think of what infection means. You see, after a couple of months sequestra are coming away (Fig. 290). This end of the tibia got loose and was pulled out. We kept pulling bones out for months and months, but the thing to remember is that eventually, with good care, these cases turn out pretty well if they receive intelligent care, in spite of osteomyelitis. But the interesting feature is the ultimate result. This picture shows the condition when most of the sequestra are out (Fig. 291). He has no motion at the seat of fracture, he has good firm union, although it is partly fibrous. He walks around; he uses a leather leg corset and is doing very well, but think of the long disability. We should not undertake bone operations lightly ever, and never if we have not the proper indications for operative interference, and these indications are the inability by conservative means to properly coaptate the fragments. If the fragments are not properly coapted, it may leave functional disability.

Fractures in the *x*-ray picture always look worse than they are in reality. The x-ray picture is only a shadow, and I have cut down on fractures and found they were not as badly displaced as I thought they were from the looks of the picture. In these operative cases we strive to get both a good cosmetic and functional result. Considering the great degree of infection and sequestration, the ultimate result in this case is very good.

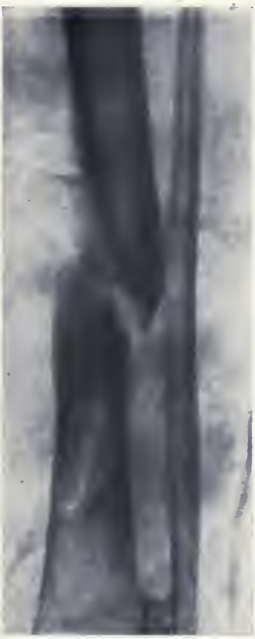

Fig. 290.

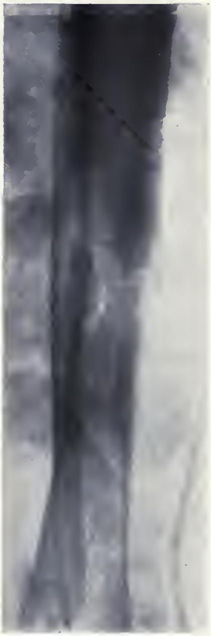

Fig. 291.

Fig. 290.—The sequestra have been removed—infection has been checked and union is taking place. Eight months after injury. The fibula has united firmly.

Fig. 291.—Ten months after injury. A small sinus remains. There must still be some small sequestra. Union is quite firm, and the axis of limb is preserved. Patient has been using leg for some months wearing a leg corset. This weight bearing favors union and repair.

Case VII.—This man was injured February 2, 1918. It is another case of spiral fracture of the tibia and fibula (Fig. 292). These fractures are almost impossible of reduction, but that does not mean that all these fractures have to be operated on, not by any means. You can get a very good functional result without operation in many instances by extension and manipulation, even if there is lateral deviation. I was taught a lesson a number of years ago in a case of this kind, and it helped to dampen my ardor relative to the operative treatment in fractures of this kind. On a trip to Alaska one of my fellow passengers slipped and fell, sustaining a fracture of the leg. I put him in a blanket splint and brought him from Skagway to Seattle, where he was taken to the Swedish Hospital, *x*-ray pictures were taken, and it was found that he had a spiral fracture of the tibia with moderate deformity. If I had had that man in

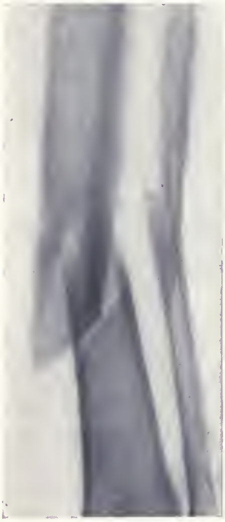

Fig. 292.

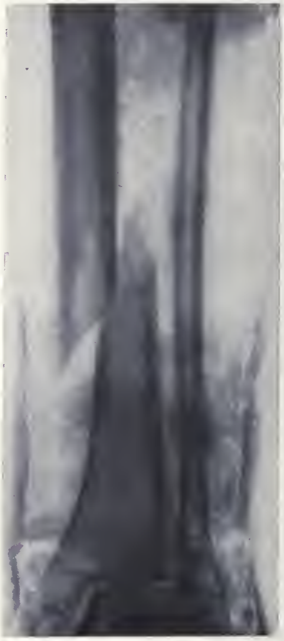

Fig. 293.

Fig. 292.—Spiral fracture of the tibia and oblique fracture of the fibula. Fracture by torsional violence.

Fig. 293.—Spiral fracture after attempt at reduction on Hawley table. It is obvious why bones will slide by as soon as traction ceases.

Chicago I undoubtedly would have operated on him, but being in a strange city and in a strange hospital I put him to sleep, put on a plaster cast, and brought him home. He showed less deformity than this case (Fig. 293), as there was ½ inch lateral deviation. He got good union and a splendid functional result. If an *x*-ray picture were taken now we would find a lateral deviation of ½ inch, but his leg is no shorter apparently. He is pleased with the result. What surgeon has not at one time or another advised operative correction of a fracture which the patient refused to submit to, and then have the case turn out very satisfactorily under conservative treatment? Those are the jolts that do you good.

Here was a spiral fracture of the tibia. This picture was taken February 3d, and the other one was taken February 8th. There is the difficulty in this case. The patient comes in with the same kind of a spiral fracture as the previous cases. The most elaborate care is taken, he is put on a Hawley table, the leg extended, a cast put on, but, if anything, the limb is worse than it was before (Fig. 293). In this fracture this (indicating) acts as an inclined plane and these bones slide by. You cannot keep them in place. An operation was proposed here and the patient consented. I used here the Hoglund saw, which works nicely. While the inlay operation is not difficult to do, it takes a longer time than the insertion of a Lane plate. This is an anteroposterior view (Fig. 294), but it shows the ends of the inlay extending down to the point I show you and the wires holding it in place. I will show you the other view (Fig. 295). With a Parham band or Lane plate you can get more accurate coaptation in an oblique fracture than you can with an inlay. This shows what I mean here. In spite of everything fitting all right, you cannot prevent this from sliding down a little bit in the inlay. It is only a little over a month since the operation was done and the patient has still his cast on. The stitches are out and the wound is clean. I made a large semilunar flap, turned it to the inner side, so that afterward the sutures would not lie directly above the operation on the bone. If you get a stitch abscess over to the side it is not likely to be followed by any serious results. This has been on about a month, and I will leave it on for probably another three weeks, then it will be taken off and, if necessary, I will put on a leg corset and get the patient on his feet as soon as possible, bearing weight on the limb. That is a point I think that is oftentimes overlooked in cases of malunion or delayed union. The putting on of Lane plates for non-union is absolutely reprehensible. It is out of date; it is no good at all. A Lane plate is out of place in non-union. The natural thing for non-union is an inlay. For malunion the best thing is to get the patient on his feet with a leg corset, and union becomes firm

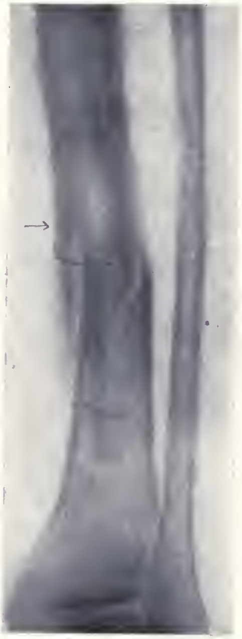

Fig. 294.

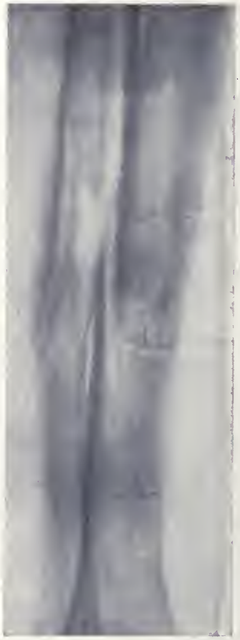

Fig. 295.

Fig. 294.—After inlay operation there is still a slight amount of lateral displacement. Inlay shows in dim outline. Arrow shows where the two fragments of inlay are in contact.

Fig. 295.—Side view of Fig. 294. On the whole, the approximation is very good. The upper wire has broken, but graft is intact.

in a short time, as a rule. The plaster cast extends from the malleoli to the tuberosities of the tibia, allows free motion of the ankle and knee. I am a great believer in that.

I showed you a moment ago a rarefying osteitis that occurs from disuse. At the seat of fracture there is a rarefying osteitis. If you have delayed union, put on a cast and keep the fragments from becoming bent and buckled, but let the patient walk and you will get union.

There is one thing we have given internally with good results, and that is thyroid extract. In the very first Albee inlay I made a few years ago I failed to fasten the inlay sufficiently. I hammered it in. It was a case of transverse fracture with non-union, and that inlay did not stay in place. It moved and it became absorbed, and the man had non-union, almost the same afterward as he did before the inlay was put in. Aside from using a leg corset, I put him on thyroid tablets, 5 grains three times daily for six weeks, and I believe it had a good deal to do with the solidification of the fracture. I mention that to you for what it is worth, but it is more or less empiric.

CASE VIII.—**Fracture of the Os Calcis.**—Here is a type of fracture that, I believe, is important to you military men from the standpoint of prognosis and treatment. This man was cleaning windows, lost his balance, fell, and landed with one foot on the cement and one foot on the grass. The foot that landed on the cement was injured, the patient sustaining a fracture of the os calcis (Fig. 296). The fracture here through the narrow neck of the os calcis is the most frequent seat of fracture. We get fractures in all directions; some in which a small oblique piece of bone has been broken off and pulled up by means of the tendo achillis; some are impacted and some are not impacted. The question of treatment and prognosis is very important. As to treatment, the question is whether, in the first place, to treat it conservatively, as I did here, or to make traction by getting behind the tendo achillis with some instrument, pulling down, nailing it with a spike, or driving in a bone-peg. I have some pictures of spikes and nails. Spikes and nails are not worth much, as a rule, because they are foreign material.

I have spiked a hip-joint for non-union, but the spikes came out, and the hip was worse than it was before. That does not happen with an inlay or graft. You can reduce these fragments if there is much deformity and drive in a bone-peg. If necessary, you can first tenotomize the tendo achillis. My judgment was that this fracture was impacted. The foot did not look flat, nor did the radiogram show much deformity, so it was my judgment that I should not do anything radical. I do not believe operation would get us a better result than he is going to get now, and I did nothing except to put the foot in inversion and flexion.

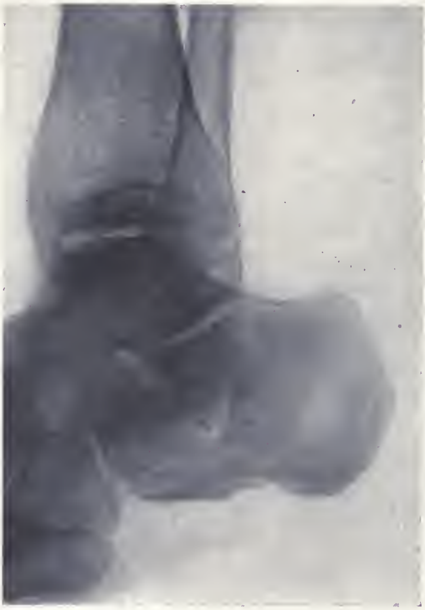

Fig. 296.—Fracture of the os calcis with impaction.

Fractures of the os calcis are prone to result in a long period of disability. Some of them never get well. Some of the patients will complain of pain and disability for years and years, and it is important to know that when it comes to making a report for an insurance company or a corporation, because they want to know how long the man is entitled to disability. Some of these patients are left permanently disabled. Fractures of this type, of which I have had quite a number, have done very well under conservative treatment. I do not like cutting down on them and pegging the fracture unless the deformity is great. I did nothing in this case except to put on a cast. It is important to give the man time enough afterward for union. I will not allow him to put any weight on that foot for three or four months. Then he should wear some kind of support to prevent the arch from breaking down. I would like to hear an expression of opinion from Dr. Ridlon in regard to this case.

Dr. Ridlon: In a fracture of this type I should have molded the foot in as good shape as possible with the cast and wait for the man to get well, and if he has good function without doing anything else, I would let it go at that. If I could trim off some of the outside fragments, some callus which is restricting motion afterward, I would do that. That is all I would do.

Dr. Hessert (resuming): That is the way I feel about it. In a case of this kind I agree absolutely with Dr. Ridlon that we should be as conservative as possible if there is fair approximation, believing that function will be fairly good. Of course, it may not be as good as it was before. We get lots of cases of fractures in firemen and workmen who fall from ladders or scaffolds, and there are other elements to be considered than those of an operative nature. As a rule, men with fractures of the os calcis have a long period of disability.

Case IX.—This man whom you see in bed is seventy-six years of age. He sustained one of the worst comminuted fractures of the neck and trochanters of the femur that I have ever seen (Fig. 297). He fell on the sidewalk and sustained this severe injury. This is a very simple double inclined plane which you see in use here, and one we have used for a very long time (Fig. 298). What does it do? With it you get flexion of the hip, you can get abduction of the thigh and flexion of the knee and extension. Of course, we have different kinds of boxes. We have some that are adjustable, allowing the knee to be raised and further flexed. This apparatus answers very well in this kind of fracture. This man has now 12 pounds of extension. We get splendid results from this apparatus. As a rule, we don't use it in fractures of the hip. For such fractures I like the Whitman position. Take this individual case. We have a little abduction, we have flexion, and we have perfect extension. It works all the time, day and night, and I think it is a very fine method of treating fractures of the femur. With it you can treat fractures of the neck of the femur; you can treat subtrochanteric fractures because there is an indication for flex-

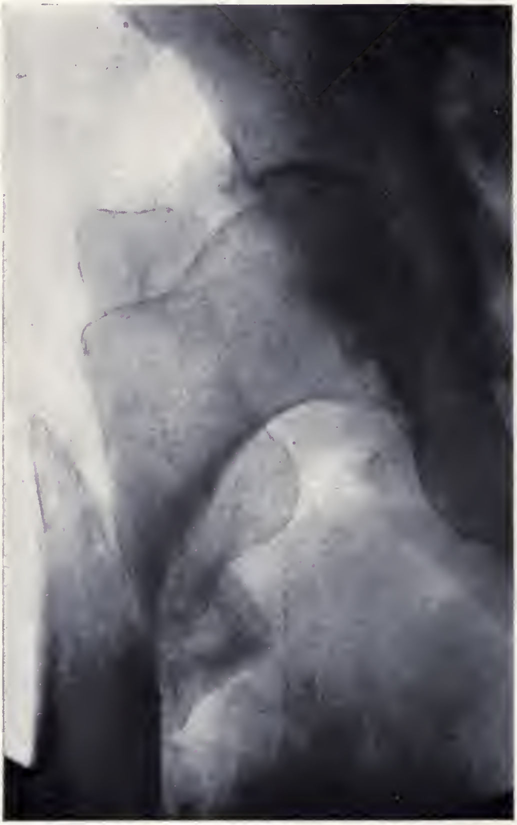

Fig. 297.—Comminuted intertrochanteric fracture of the femur in an old man. Note calcified femoral artery. There is some lipping of the rim of the acetabulum the result of an old arthritis.

ion in treatment in fractures of the upper end, for in those fractures of the upper end the fragment is pulled upward. You get flexion and abduction. You can accommodate the lower fragment to the upper one by flexion, abduction, and extension. This apparatus gives you your extension and flexion. We have some at a greater angle, some that are adjustable, and the results are very fine. Some of the cases of fracture of the shaft that can be treated conservatively do not require flexion at the hip or knee. You can treat them with simple extension. A transverse fracture of the shaft of the femur to me means operation. I would like to see some one treat conservatively a transverse fracture and get the fragments in apposition; I have never been able to do it with satisfaction. In oblique fractures I would use the external Hamilton splint and Buck's extension. As I have said, transverse fracture means operation in ninety-nine cases out of a hundred, and we operate on them with good

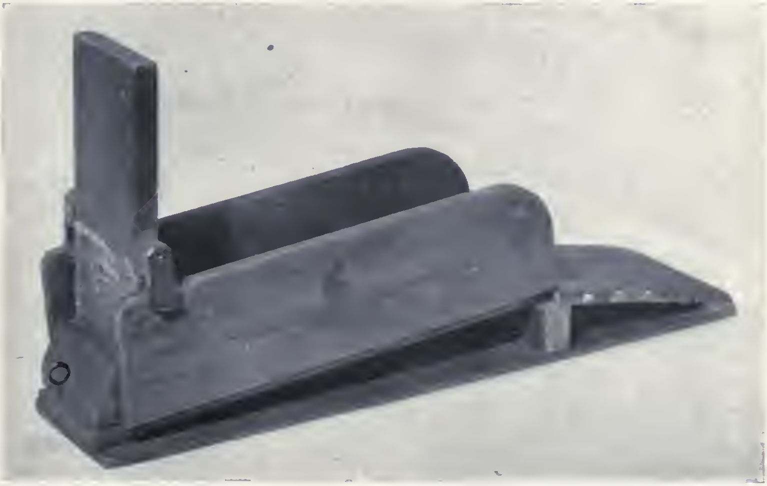

Fig. 298.—Double inclined plane—old wooden model. The leg is placed in the box, and the foot held in position by means of lateral strips of adhesive plaster, similar to Buck's extension. The whole apparatus is then placed on a board extending over the foot of the bed, inclined at any desirable elevation, and the weight card is tied to the eyelet on box. Rollers are placed under the box to lessen friction. This outfit is crude, but very serviceable.

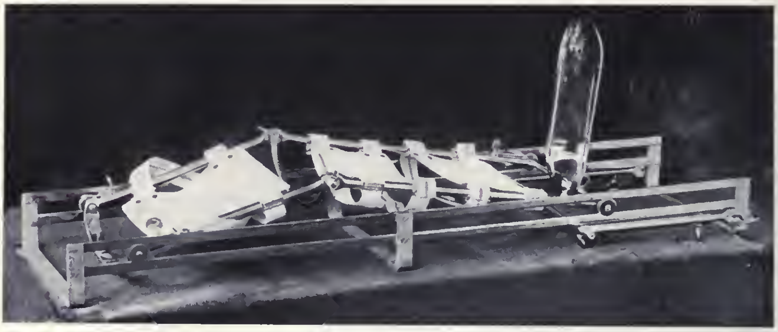

Fig. 299.—An improved double inclined plane or railroad splint. The bars, which slide on rollers, can be fixed at any angle and can be lengthened or shortened by reason of telescoping rods. The foot is held to the foot board by means of wide laterally applied strips of adhesive plaster. The leg rests on the canvas strips, which can be padded with cotton or felt. The leg is entirely exposed while traction is maintained, and accessible to dressing in case of compound fracture. This splint will answer for all fractures from the lower third of the leg to and including the hip-joint.

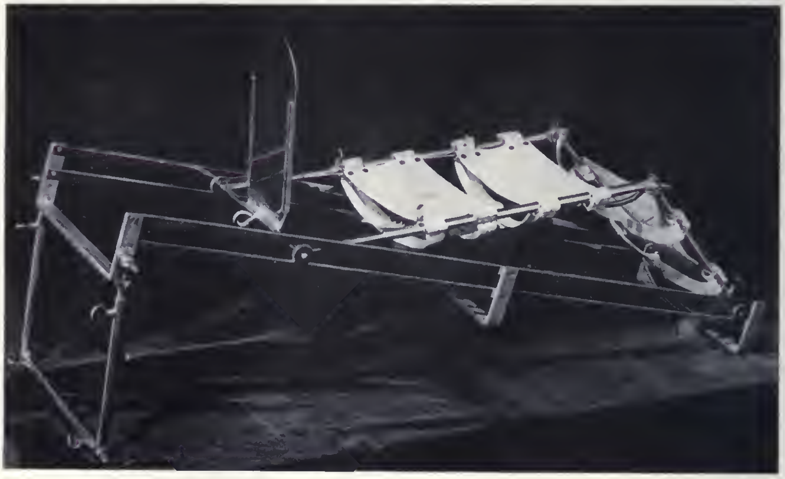

Fig. 300.—The standard supporting the distal end has been brought down, and the splint can be further elevated by loosening the screws and pulling out the rods. The traction card is tied to the eyelet at base of foot board and carried over the pulley. This apparatus fills all indications where flexion of the hip and knee are required with traction. The knee can be bent to any desirable angle. The apparatus is very stable, and there is a minimum of friction, thus lessening the relative pull on the adhesive plaster. Twenty pounds exerts a strong traction.

results. This man has been in bed two weeks. He feels comfortable. We will keep him in this apparatus until we get some union, depending on conditions, which may be six or eight weeks. He will not be able to use that leg, provided we get union, for three or four months. As soon as we get sufficient solidification we can get him up in a plaster cast. There is always danger of hypostatic pneumonia in these cases, and if he should develop signs of pneumonia it will be necessary to change the treatment entirely and get him up.

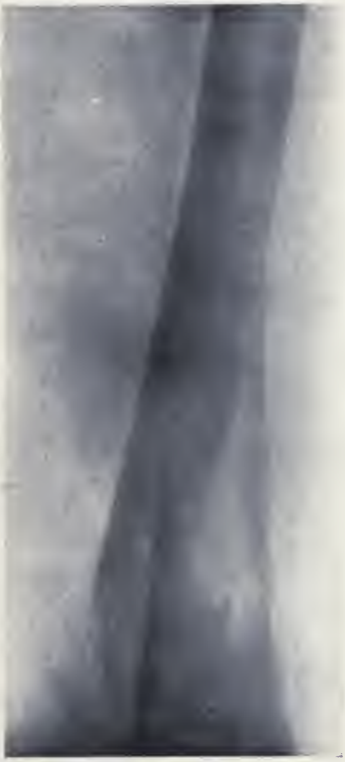

Fig. 301.

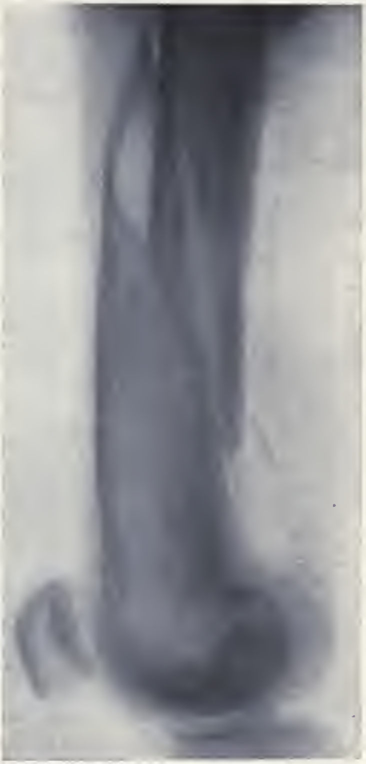

Fig. 302.

Fig. 301.—Anteroposterior view of spiral fracture of femur. Note calcified femoral artery. This is the position before applying extension.

Fig. 302.—Spiral fracture of lower end of femur. There is about one inch shortening, which was corrected by extension.

Case X.—This man is sixty-four years of age. He sustained a spiral fracture of the femur at the junction of the lower with the middle third (Figs. 301 and 302). This case calls for extension and flexion of the knee. He is in a double inclined plane with flexion at the hip and flexion of the knee, with the necessary amount of extension. He has 15 pounds on for extension. The heel is kept free from the underlying surface. Lateral strips of plaster are carried around the foot of the apparatus and the traction is made partly on the box and partly on the leg (see Fig. 298). The adhesive plaster is carried over the line of his fracture. This contrivance is one that any carpenter can make for you or you can make it yourself.

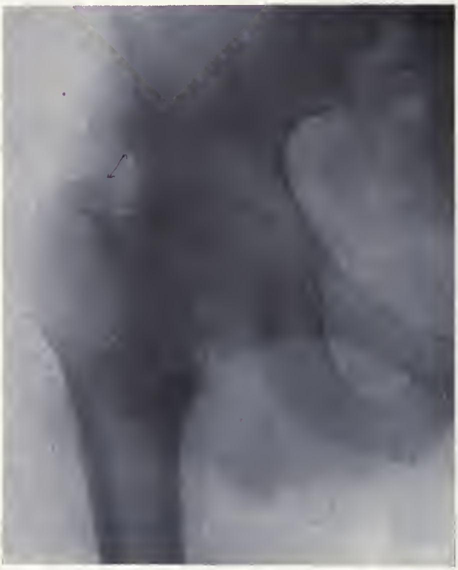

Fig. 303.—Ununited fracture of neck of femur—two years' standing. Some absorption of neck. Great pain and disability. The distal fragment is resting against the rim of the acetabulum. There is 1½ inches shortening.

Case XI.—This man is forty years of age. He fell off a ladder, striking on his hip, and sustained a fracture of the neck of the right femur. He was greatly disabled. He went on untreated for two years, during which time he suffered great pain. He was so disabled that he could not work. He felt miserable. I will show you an *x*-ray showing the fracture (Fig. 303). As a last resort he came here and we were determined to do an open operation. I made an anterior incision and an outer incision, cut down on the joint, and, much to my surprise, after two years there was no union. I was not able to demonstrate that before operation, owing probably to the great muscular rigidity, and even the *x*-ray picture did not enlighten me on that. When he was asleep I saw there was motion at the point of fracture. We dragged the limb over, extended it, abducted it, and put in a bone-peg. There was no union and there was motion at the seat of fracture. There is considerable absorption of the neck. I abducted it some, then took a graft from the tibia and drove it in here. We took the cast off after eight weeks to look at it, and it is in perfect condition. He has now about ½ inch shortening. He had 1½

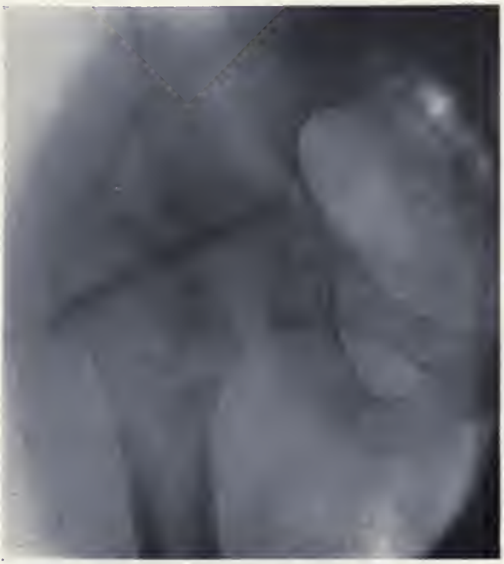

Fig. 304.—Bone peg from tibia driven into head of femur. Peg projects slightly beyond head of bone. Position of head and shaft is more nearly normal than in previous view. Shortening corrected to ½ inch.

inches before operation. Having immobilized the fracture, it relieved pain and will restore his function. So far the result has been very satisfactory (Fig. 304).

Case XII.—Here is an *x*-ray picture of an impacted fracture of the neck of the femur that raises the question of the advisability of breaking up such fractures (Fig. 305). I do not know whether I can take a dogmatic stand on that or not, as sometimes I am in doubt whether to break them up or not. I will say this, however, it is not the easiest thing to break them up unless you use brute force and possibly cause some further injury. If there is not too much eversion, if there is not too much shortening, I would let that man go, taking into account the age of the patient and his general condition. In other words, if there is little eversion and not too much shortening, I would let the man alone, as I did here. It was the proper thing to do because I believe the result we got here, with only about

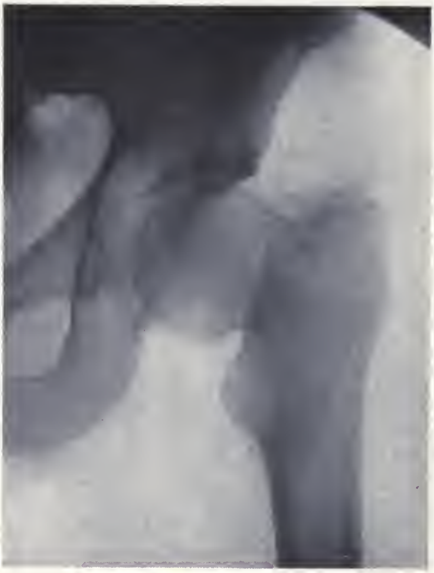

Fig. 305.—Case of impacted fracture of the neck of the femur. Position very fair —not much deformity or shortening. Very little eversion of foot.

½ inch shortening, is very good. I took his cast off the other day and the result is not much worse than you would get by another method. I would not operate on a patient with a fracture of this kind. I believe in a case of impacted fracture, if the position is good, and there is not too much eversion (there is bound to be some), and there is not too much shortening, I would let him alone. That is the way I have been treating these cases here at this hospital, and I am getting probably as good results as anybody else with fractures of the neck of the femur. I see a lot of cases that are treated elsewhere with no better results than ours. I did not put on any extension, as it was not required. I put him in a body cast. He has been up and around because I took the cast off the other day. It is about six weeks since he was here. Even if a fracture is impacted, it does not necessarily mean that it cannot loosen up afterward and result in more deformity if the man gets up and puts weight on the leg too soon. You have doubtless heard of Cotton's treatment of hip fractures by impaction. He has had splendid results in that way. I have seen patients in whom he has demonstrated beautiful results. I have seen results just as good from other methods. I do not know whether I agree with him as to the advisability of this line of treatment. If it is not the best thing to do under all circumstances, let it alone, treat the case conservatively, put the patient in a cast, and keep him up and around.

Case XIII.—This old man was brought here October 3, 1917, with a compound comminuted fracture of the tibia and fibula. This fracture-box shows you how you can get all the flexion you want (see Fig. 298). If you want acute flexion you can get it. You can make such an apparatus as this yourself, or you can have a carpenter make it for you in a short time, and it is sufficient. I have been connected with this hospital for ten years and during that time I have used this apparatus a great deal. I do not use it in every case, but there are certain cases where it comes in very handy and can be used to great advantage.

In compound fractures we first treat the infection, and secondly the bone. If necessary we open it up widely, get the freest possible drainage as long as necessary, or until such time as we can deal with the bone itself. Primary operations on the bone are not indicated. I would get the bones together as well as possible primarily, and later on get better reduction, but treat the wound as a wound, first of all. That is what we did here.

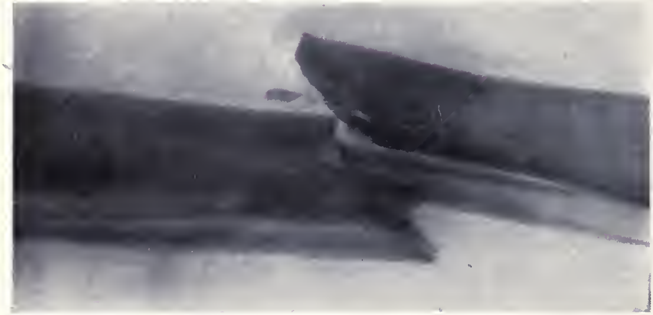

Fig. 306.

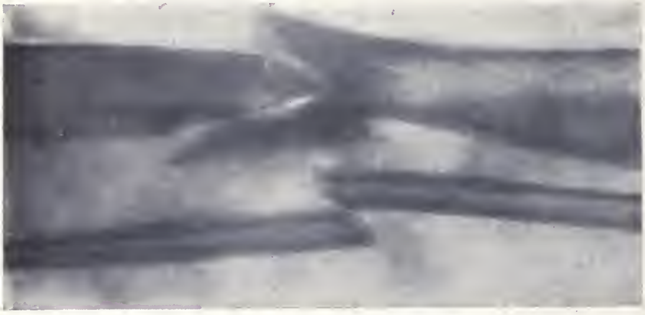

Fig. 307.

Fig. 308.

Fig. 306.—Compound fracture of the tibia and fibula. Bending type of fracture.

Fig. 307.—After provisional reduction in cast.

Fig. 308.—Compound fracture—after the lapse of several months a number of sequestra were removed, notably the large triangular piece seen in Fig. 306.

As a rule, you can tell from the picture in what direction the force was applied in producing a fracture. The force was applied from this side (indicating). The tissues started to break or separate at the point I show you, and one line of the fracture ran up like this (indicating—Fig. 306), and another in that direction, and oftentimes this triangular piece is loose in there. This patient was treated this way, and this picture gives us a side view. He had a certain amount of necrosis and se-

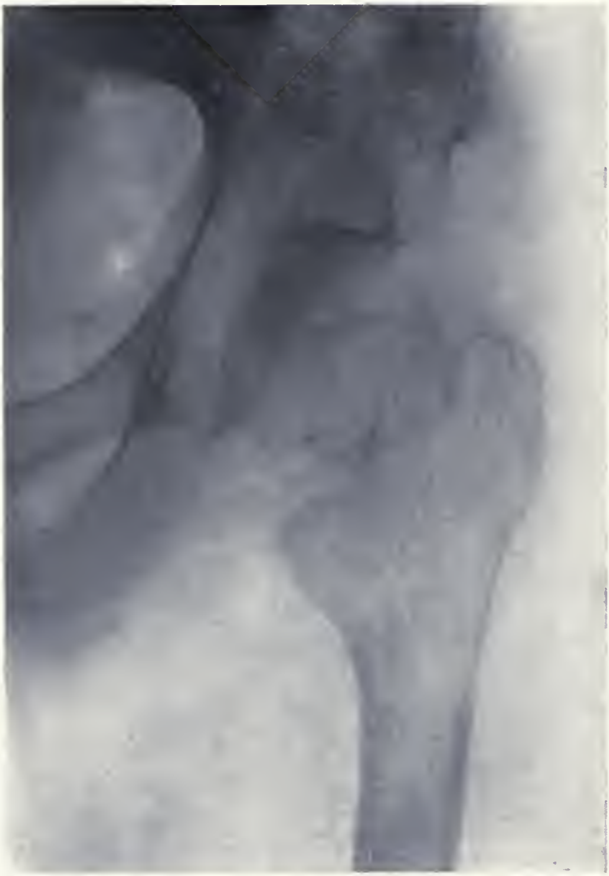

Fig. 309.—Fracture of the neck of femur of six weeks' standing. No union. Not impacted. Shortening could not be determined, as the leg was already short, the result of a previous accident.

questration, but no infection in the strict sense of the word. The picture shows a perfect reduction taken through the cast (Fig. 307), and you can see the bones are perfectly lined up. The other view shows reduction of the bones to keep the line itself preserved, and it is a good result. Some of these loose fragments came out in time. This picture was taken January 1st (Fig. 308). In the meantime some of these fragments either came out themselves or were removed. There is one piece still in there and it is evidently going to stay. After the wound had healed up and the bones were fairly united, I put a

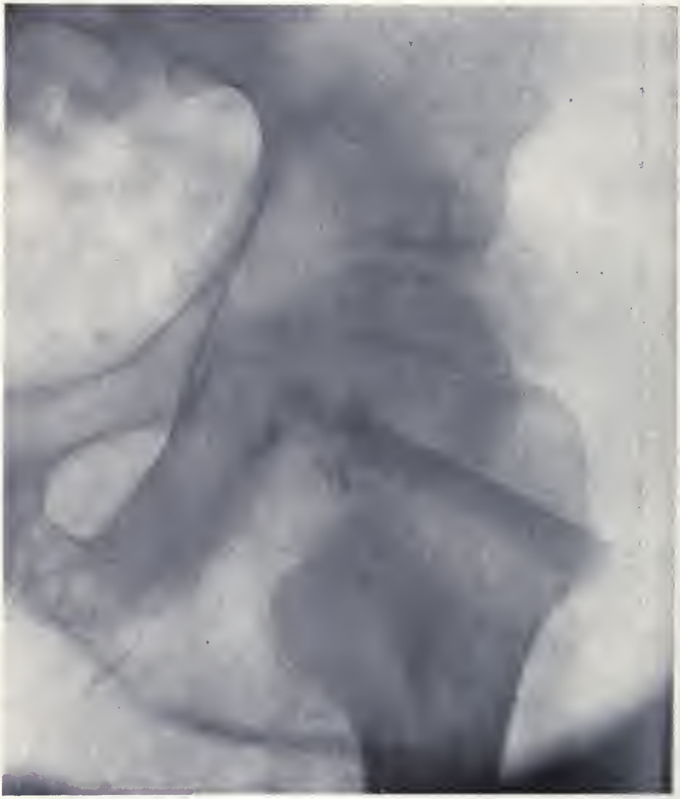

Fig. 310.—Condition soon after operation. Bone peg seems a bit low in head of femur, but ultimate result was splendid.

leg corset on him and allowed him to walk around, and took it off some time ago. The old gentleman is going to have a good result, even though the bones are not in good apposition cosmetically.

I do not use Lane plates in compound fractures except once in a very great while. In compound fractures in which the soft parts are very extensively lacerated and the bones extensively exposed—that is the only place where I would put on a Lane plate, and then take it off later. As a general proposition, however, I do not advise any fixation apparatus or internal splinting of compound fractures.

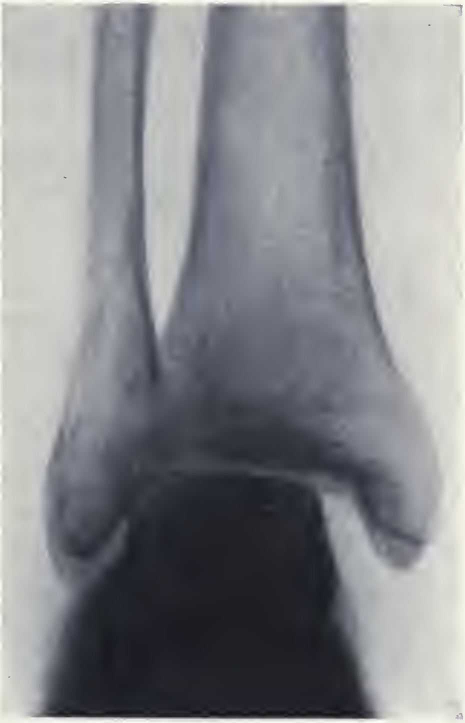

Fig. 311.—Anterior view of Pott's fracture. Fracture of fibula somewhat indistinct. Astragalus is slightly displaced outward. Note the interval between astragalus and internal malleolus.

Case XIV.—Here is another hip case. The patient is a railroad man by occupation. He fell down and fractured his hip (Fig. 309). He was at home for six weeks without treatment, and I saw him at the house, diagnosed a fracture of the hip, and sent him to this hospital. Whether my judgment is correct or not in what is to follow I will leave to you. I determined that if at the end of six weeks there was no union, the best thing I could do would be to drive a bone-peg in there, which I did very soon after he came in, and I think the result is going to be very good. This picture shows the condition shortly afterward (Fig. 310). He was operated on September 3, 1917, about six months ago. He has no cast on. He has pretty

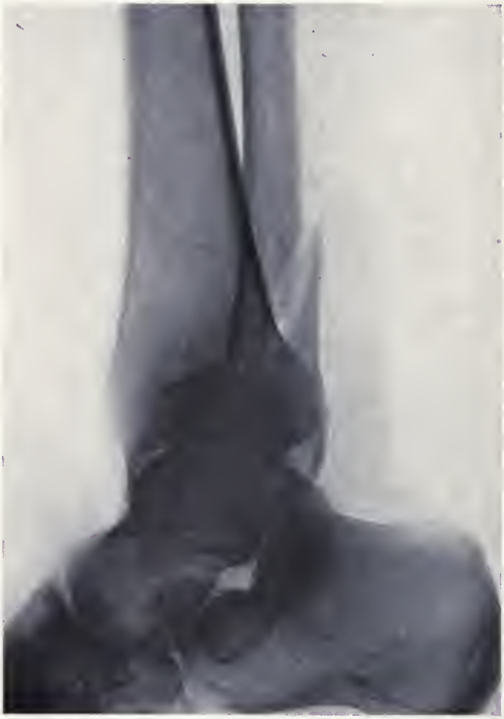

Fig. 312.—Lateral view of Pott's fracture showing plainly the fracture of the fibula.

good motion of the hip and knee. This picture was taken more recently, and shows the graft in place. The angle, I believe, is pretty well preserved. He has a deformed foot, and we cannot predict the degree of usefulness it may reach, but I think we did the best thing for him under the circumstances.

Case XV.—Here is a man with an ordinary Pott's fracture. I have already spoken of the importance of having two views of such fractures. In looking anteroposteriorly you cannot tell that anything has been wrong unless you are careful (Fig. 311). That looks all right, except the relation of the astragalus to the inner malleolus is not normal. There is some outward dislocation there. This lateral view (Fig. 312) shows distinctly an oblique fracture of the fibula. There is nothing remarkable about this case; it is a typical fracture of the Pott's variety.

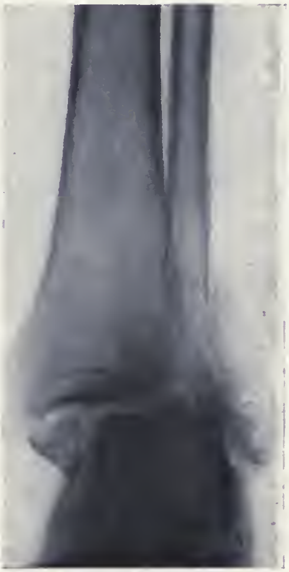

Fig. 313.—A different type of Pott's fracture, in that there is a fracture of the inner malleolus, allowing greater displacement of the astragalus outward to the fibular side.

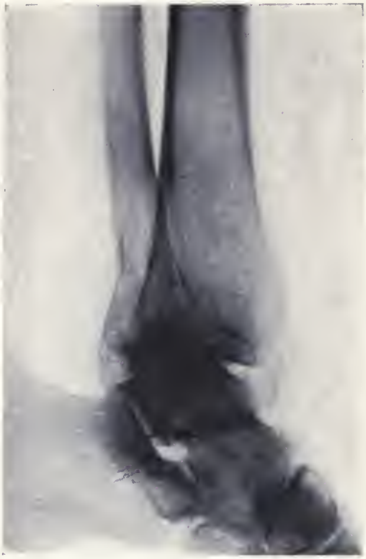

Fig. 314.—Lateral view which gives no just conception as to the amount of deformity. Note the small piece of bone torn from the anterior edge of tibia. Sometimes a large piece is broken off here, allowing backward dislocation.

The case shows the value of always having two pictures, taken at right angles to one another.

CLINIC OF DR. GEORGE D. J. GRIFFIN

MERCY HOSPITAL

A GENERAL DISCUSSION OF FRACTURES

Summary: A case of fracture of femoral shaft with non-union—causes of non-union; fixation in fractures—the plaster cast versus splints; necessity of early manipulation of joints neighboring line of fracture; early treatment of compound fractures—"Keep fingers and forceps out," the Carrel-Dakin treatment; proper place of the *x*-ray in the treatment of fractures; internal fixation—fixation by impaction—foreign body and autogenous bone-graft; internal splints.

We come today to the general discussion of fractures. I feel that if I occupy some of your time in advance in driving home to you in such a fashion as to impress them indelibly upon your mind some very important points it will be time well spent. Much has been said and written upon this subject. Much will be said and written for a long time to come. Even then, much will remain to be emphasized. In no branch of surgery can more glowing results be obtained than in bone work. Likewise, in no branch of surgery can more disastrous experience be met, more unsatisfactory results be obtained, or more adverse criticism be hurled at a doctor than in the department of bone surgery. I am showing you here as an evidence of this statement four views of a fracture of the femur. The first two pictures (Figs. 315 and 316) were taken last August, shortly after the accident. The last two were taken last week (Figs. 317 and 318). This case came to me last week with the history of the injury being the result of an automobile accident. The accident occurred in May, 1917. The case has been treated and has been under constant observation. No one can say in any given case why non-union results; but I do say that in this case all the elements appeared in favor of union. Nature did her share, as she always will if given half a chance. Figures 315 and 316 show an abundance of good callus. When I first saw this case no restraint was worn by the patient, except for two or three stiff fiber strips about 1½ inches wide held in place by a flimsy cotton bandage. A cast had been worn, but was removed three months ago by the attending man's order, and the patient was told to walk. From Figs. 317 and 318 you can gain a fair estimate of the patient's ability to use her leg,

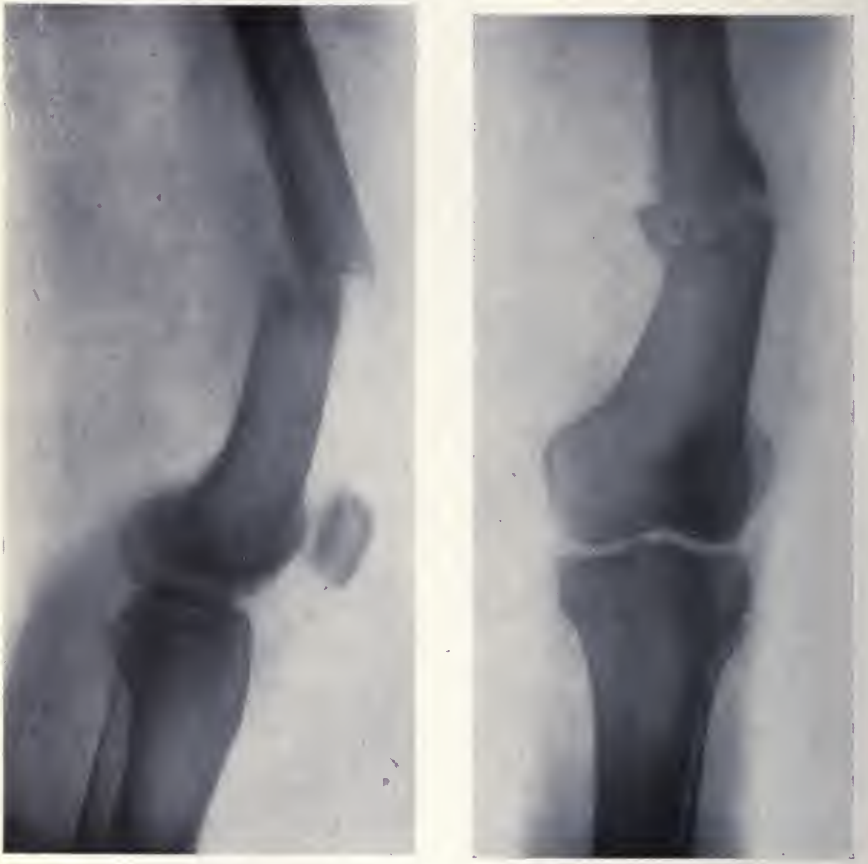

Fig. 315. Fig. 316.

Figs. 315 and 316.—Tranverse fracture of femur a few days after the accident.

and you can see the abominable condition in which the limb has been left after nearly one year's treatment. Your results in bone work will stare you in the face. Be careful and cautious, but not too much so. Be certain of what should be done and then do it. Have the temerity and courage to back up your convictions. Do not hesitate, but set about it at once.

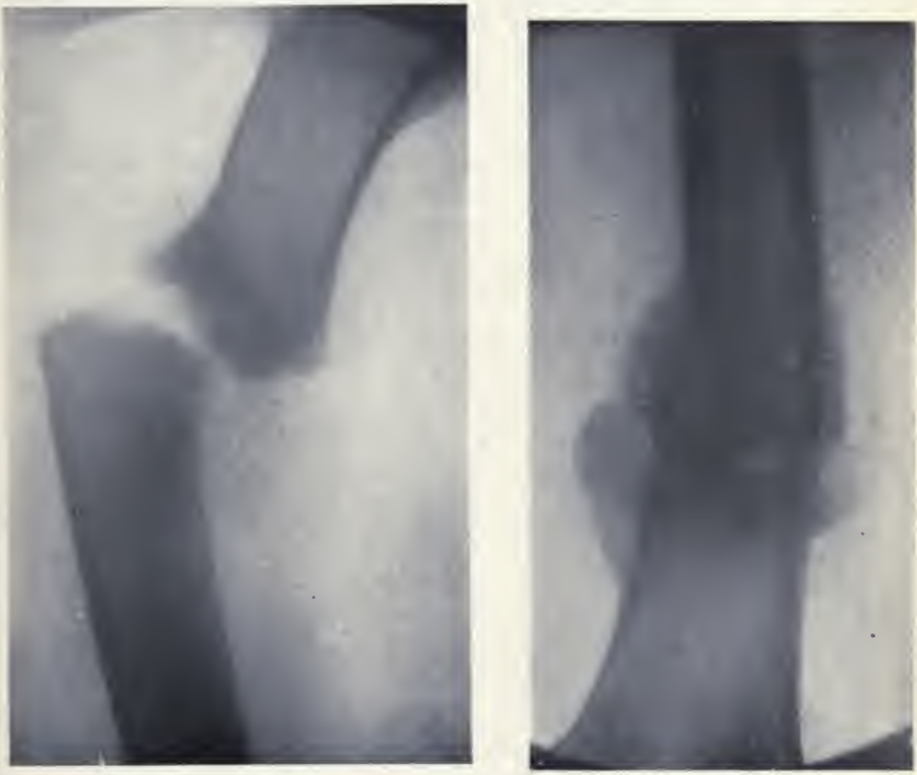

Fig. 317. Fig. 318.

Figs. 317 and 318.—Same fracture shown in Figs. 315 and 316, but radiographed about one year later. A case of non-union.

This brings us to the cause of non-union. By far the most frequent cause is the interposition of soft tissue between fragments. You ask, How may we know it is there? In practically every case of fracture with extensive displacement of the fragments soft tissue will find its way between the ends of the bone. If this happens, the case must be operated, for the osteoblasts from either side will not penetrate the tissue. If the displacement is not marked or if reduction is easily accomplished and maintained, there is most probably no tissue between the fragments. These cases can be treated by the conservative method, and a good result, functional and anatomic, will be obtained. Nature is a wonderful surgeon, and if given a fair opportunity will do a great deal for you. Among other causes of non-union may be mentioned poorly adjusted or improper devices for immobilization. Let me say now: Beware of the complete circular cast. If you must put one on, split it as soon as it has hardened. If you do not, some day you will have an ischemia of a limb or a paresis from constriction. Likewise I would urge you to refrain from applying a cast for at least three days following the injury. Almost immediately after a fracture swelling occurs, and continues for a variable period. If a cast is applied, the least to be expected is a poorly adjusted appliance, because the cast is gaged to an abnormally large limb, and when it resumes its normal condition the cast is loose and non-effective. Another advantage of splitting a circular cast that may be properly mentioned here is that as shrinkage of the part occurs—as it does and will occur in every instance—the cast may be trimmed and so kept close fitting.

The health of the individual and his metabolic activities are among the factors to be reckoned with in non-union.

As to the type of restraint to be used, as a general rule to follow I may say that casts or extension should be applied for all fractures of the lower extremities. For the upper extremities casts may be used with excellent results above the elbow. For fractures of the forearm between the elbow and wrist I prefer splints, and I would urge you, if you resort to that treatment, to use two—one anterior and one posterior—to be readjusted just as often as necessary. Fractures of the elbow require special attention and special adjustment. In the majority of cases the position of acute flexion, the so-called Jones' position, will give the desired result. Fracture of the olecranon process, fracture between the condyles of the humerus, and fracture of the internal condyle should be dressed in complete or nearly complete extension.

Never fail to move and manipulate joints after the first week or ten days, and continue it at regular intervals afterward. If you neglect this point, ankylosis will be your penalty. So much for the conservative treatment of fractures.

Before taking up the subject of operative interference, I wish to say a few words relative to compound fractures, and my first demand of you is this: Keep your fingers out. If a bone protrudes, asepticize it as thoroughly as possible, with no handling by fingers, and return it. Sometimes painting with tincture of iodin will suffice. If only a small splinter protrudes, with sterile bone-clipping forceps clip it off, pressing hard on the skin to push out that part which is just under the skin. Keep your fingers out of the wound; keep your forceps out of the wound, unless an artery is lacerated, which must be tied; keep your probes and drains out of the wound. I am thoroughly convinced that a great deal of the infection that occurs in compound fractures is directly traceable to meddlesome interference by us doctors. I am so convinced of it that in the compound fractures that come to me, and through the corporation work which I do I see many, I have adopted a systematic method of treatment. If the bone protrudes, I follow the advice I have just given. If the bone does not protrude, I first cover the wound and thoroughly cleanse the surrounding skin, removing grease with benzine and alcohol, and drying, after which I paint a large area with tincture of iodin. This removes the possibility of washing foreign matter into the wound. If dirt is really ground into the wound, I remove it with sterile forceps; otherwise, I thoroughly infiltrate the wound with tincture of iodin and dress it, with no further manipulation. After three days, if no infection occurs, I suture the wound and obtain union by primary intention.

I am showing here illustrations of a compound fracture treated according to the technic just given, with no infection and primary union of all subcutaneous structures (Figs. 319 and

320). The skin surface sloughed away from the devitalizing effect of the traumatism and delayed work on the bone, the fragments of which were locked effectually in displacement. In reference to a possible tetanus infection, always follow the rule to give antitetanic serum when in doubt.

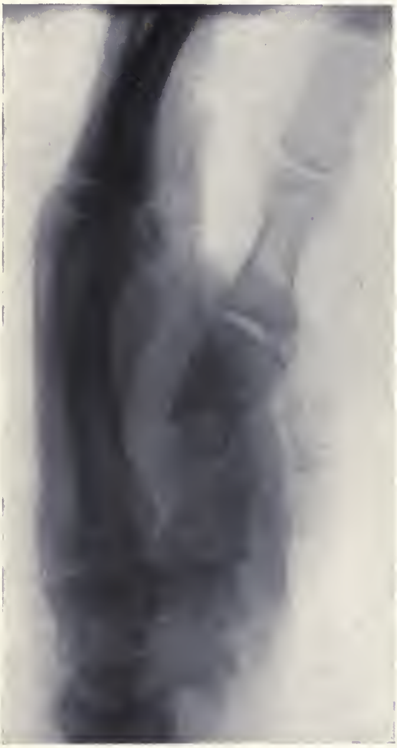

Fig. 319.

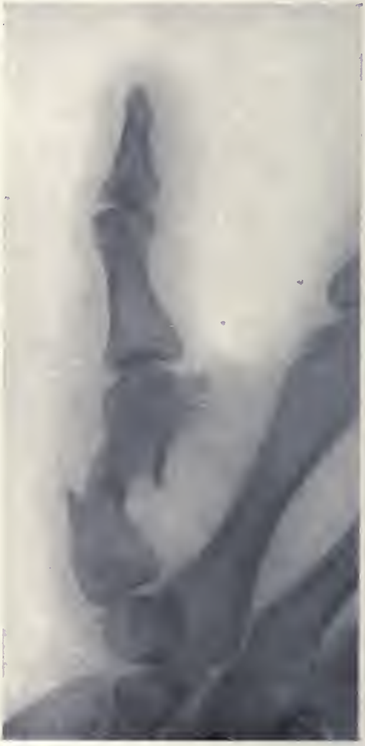

Fig. 320.

Fig. 319.—Compound fracture of fifth metacarpal bone.

Fig. 320.—Same case as Fig. 319 after supposed reduction. Fixation finally obtained by impaction of the fragments.

I might refer here to the treatment of all wounds in general and compound fractures in particular instituted as a result of war work. I have in mind the Carrel-Dakin treatment. Originally, this treatment consisted of the continual moistening of all parts of the wound with a solution of sodium bicarbonate, calcium chlorid, and boric acid in the following proportions:

Sodium bicarbonate	18
Calcium chlorid	14
Boric acid	5
Water	1000

The sodium bicarbonate reacts with the boric acid in the following manner to form borax:

$$2NaHCO_3 + 4H_3BO_3 = Na_2B_4O_7 + 2CO_2 + 7H_2O$$

A further reaction takes place between the borax and chlorid of lime (bleaching powder) thus:

$$Na_2B_4O_7 + Ca(ClO)_2 = 2NaOCl + CaB_4O_7$$

In this manner sodium hypochlorite was formed. The chlorine atom was unstable and, liberated in a wound, performed its disinfectant and antiseptic function. For the same reason, its instability, fresh solutions were necessary. I will say now that it is not Labarraque's solution and it bears no relationship to it.

Further work brought out the fact that the hypochlorite underwent a chemical reaction in contact with proteins in the wound secretions and formed a chloramin which exerted the germicidal action in an infected wound. Chloramins are the active principles in solution used now in the Carrel-Dakin treatment, and they are used up to 2 per cent. strength. These preparations have great advantages over the first solutions, chief among them being that they are less irritating, possessing practically no irritant qualities, and can be used in greater strength. The original solutions were caustic and irritating to the unbroken skin and necessitated measures of protection. Unquestionably, when properly used, the Carrel-Dakin treatment is decidedly advantageous. If you recall, I stated that the treatment called for the continuous moistening of the wound. I did not use the term "continual irrigation." The treatment consists in regular instillation of the solution into the uttermost depths of the wound at definite intervals, usually two-hour intervals, by a special apparatus, consisting of multiple rubber tubes, in such quantities as to provide constant moisture to the wounded area. In so far as its use in office work is concerned, to clean a wound preparatory to dressing it; or insofar as the single daily irrigation of the part in home or hospital is concerned, I do not believe that the results attained are greatly superior to those obtained by the use of older antiseptics. This much can be said in its favor, it does not lose its efficiency when coming in contact with proteins and albumins. The majority of other chemicals combine with those substances, thereby self-limiting their activity. I would condemn the routine irrigation of all wounds from the time of injury. I urge waiting until the early evidences of infection are manifest, and will predict that, if properly handled, many wounds in civil practice will not become septic.

I digressed somewhat from my original subject, but I want to impress upon your minds the proper method of handling compound fractures. Always try to reduce a fracture immediately and apply a temporary restraint. Be sure and *x*-ray your fractures after reduction, because only by that method can you determine that reduction has been accomplished. I refer you again to the pictures that I last showed you. The last three pictures were taken after reduction had been attempted. If I had not *x*-rayed this hand I would have been satisfied that I had brought the fragments in apposition. If you will look closely you will see that it is impossible to manipulate those fragments into position, because the lower fragment is overriding the upper fragment and is posterior to it. You will see also that the upper fragment is twisted and both have projecting spicules. Here are pictures of fractured forearms taken after reduction had been supposedly accomplished. These patients were under my care from the time of injury and defied my efforts to reduce them (Figs. 321, 322). You see here pictures of each case after I operated them. You will notice that I have used Lane plates in the arm cases. You will from time to time hear Lane plates condemned. I will grant that they are foreign bodies, but in about 65 per cent. of the cases give absolutely no trouble. They are most effectual in holding fractured bones together and in many cases are indispensable. Among the various mechanical methods of holding fractures, I will mention the following:

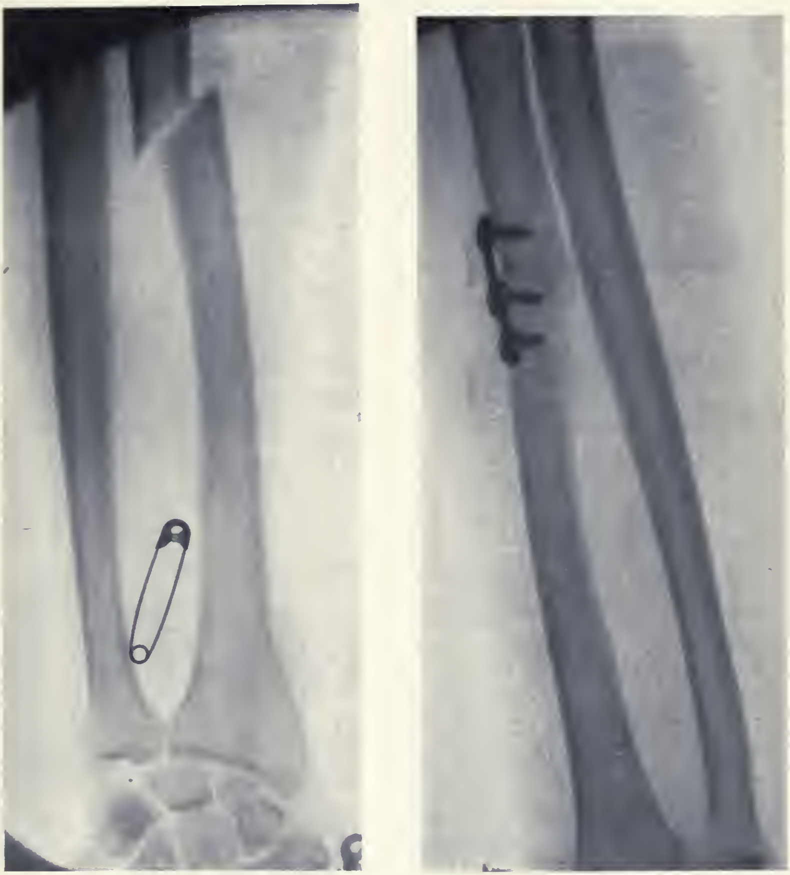

Fig. 321. Fig. 322.

Figs. 321 and 322.—Fracture of the shaft of the radius before and after fixation by Lane plate.

1. Bone-grafts or transplants.
2. Bone-plates.
3. Lane plates—vanadium steel.
4. Impaction.
5. Wiring.

Among the most spectacular advances in constructive surgery in the past few years may be placed foremost the bone-transplant. We have now a method of overcoming persistent non-union. When bone is removed from a living extremity there is a coagulation of the cells and vessels of the removed portion through which and around which the lymph is unable to flow. This, of course, results in the death of the cells in the lacunæ and in the haversian canals. This was most ably brought out and clearly demonstrated by the very recent work of Drs. Gallie and Robertson, of Toronto. They also showed that, although the cells die, the osteoblasts absorb nutriment and proliferate and are the active factor in the production of new bone in the bed of the transplant. Transplant, in my opinion, should only be used for old fractures where fibrous or non-union exists.

The pictures of the Lane plates show very effectually how they are used and their action. They are purely mechanical restraints, and I advocate their use in recent intractable fracture. Bone-plates are not so well known, but, I believe, will ultimately come into more general use. They have the advantage over the Lane plates of being ultimately absorbed.

Frequently cases are met with where it is possible or desirable to impact bones, and that by virtue of such impaction remain in position. If this is possible it should be done, and the use of any foreign body avoided. I show here the fracture of the metacarpal bone after operation (Figs. 323–326). The fragments were covered by muscle tissue, as all badly displaced fractures will be. You will see that no wire or restraint was used. This was a case in which I was compelled to use the impaction method to hold the fragments in position. They slipped somewhat, but I shall leave them alone now. Fractures of this kind give more trouble than larger bones, and the more interference there is, the more unsatisfactory the result.

Wires or kangaroo tendon may be used in fractures of small bones of the foot or hand and in fractures of the patella and clavicle. In all other cases the use of wire is to be deplored. At best it only holds the bones in fair apposition without immobilization. To accomplish your object in a bone operation immobilization should be secured. The contention has been raised in the past that some motion in a fracture was not only beneficial but desirable; that slight motion stimulated callous

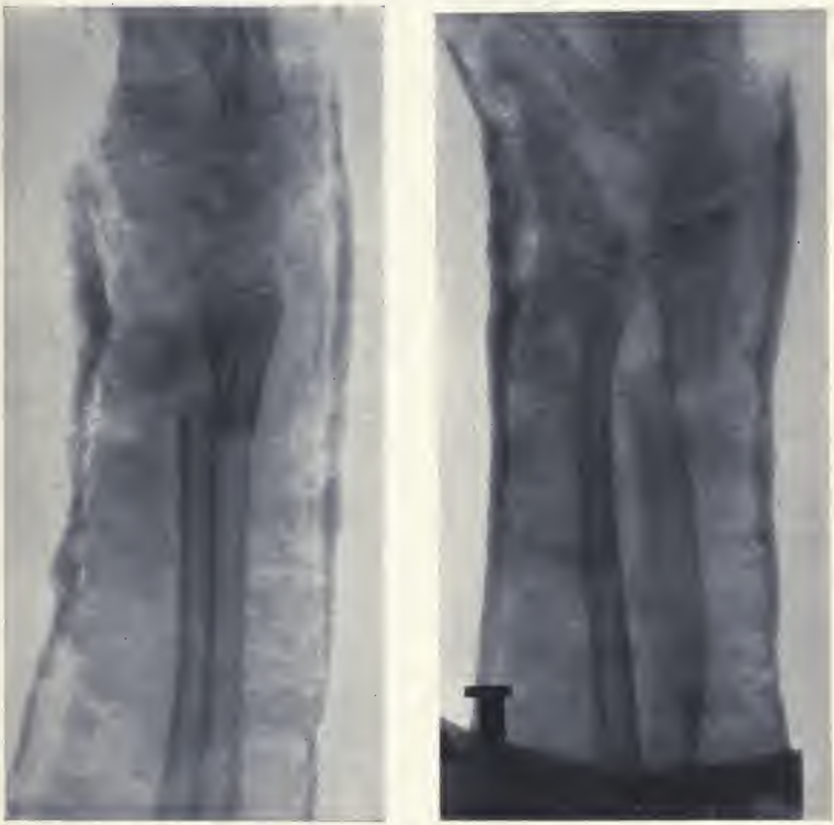

Fig. 323. Fig. 324.

Figs. 323 and 324.—Fracture of both bones of the forearm. Failure of conservative treatment. Successful reduction by open operation and Lane plate.

formation. This point may be well taken, but no one will deny that motion is opposed directly to immobilization, and after union the shaft of a bone is immobile. The converse should also be true, and is true, that if union is desired, immobilization should be maintained. After operation apply a plaster cast and keep it applied until union is obtained, removing it only to massage the parts or to manipulate joints.

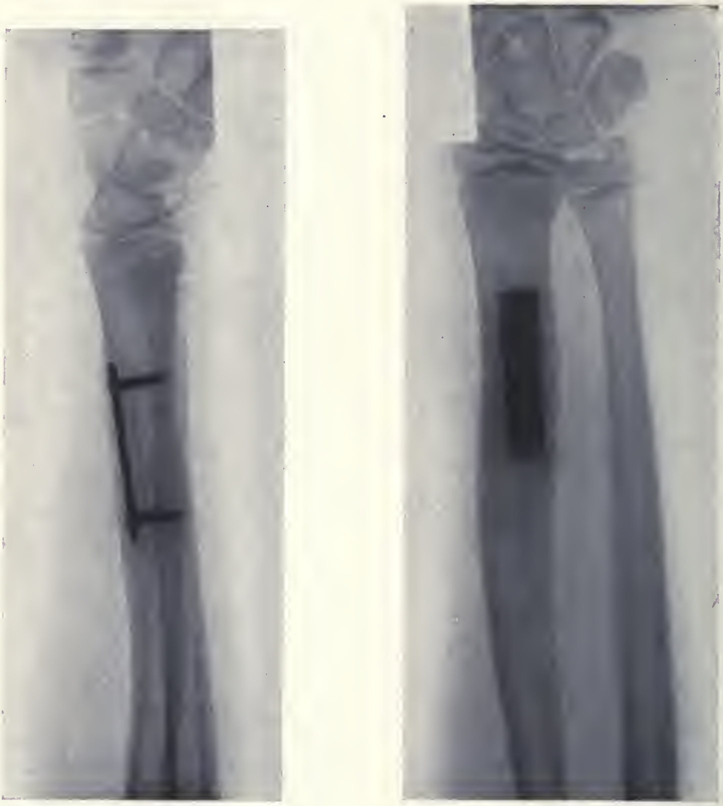

Fig. 325. Fig. 326.

Figs. 325 and 326.—Fracture of both bones of the forearm. Failure of conservative treatment. Successful reduction by open operation and Lane plate.

By way of closing I want to caution you against carelessness, or indifference, or negligence of technic in bone operations.

Bones have not the same resistance to infection that soft tissues have. The saprophytes of the air may even inaugurate an infection that will bring to naught all your work. Keep your fingers out. Keep them off the parts of the instruments that come in contact with the wound. Handle your plates, screws, sponges, ligatures, everything, in fact, with forceps. Also, do not be in a hurry to operate upon a compound fracture. Wait until the soft parts have completely healed. And never, never operate on a bone in the presence of an active, suppurating infection. It may prove disastrous; and the least you can possibly hope for will be a sloughing of the transplant, or the necessity of reopening and removing your plates to cure a sinus, and in the end you will find that you have accomplished nothing, because bone will not unite in the presence of an infection. Wait. Let the infection subside, and you will be fully repaid for the delay by the knowledge of your work well done. That in itself will often be the greatest reward and greatest recompense you can be given. There will be a feeling of internal satisfaction that even King Midas' gold could not bring you.

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SURGICAL CLINICS OF CHICAGO

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CLINIC OF DR. ARTHUR DEAN BEVAN

Presbyterian Hospital

CONGENITAL WRY-NECK

Summary: Etiology and pathology of wry-neck; treatment—importance of early attention—the Mikulicz operation; after-treatment.

August 14, 1918.

I desire to present to you this morning a case of congenital wry-neck. I would like to discuss this subject with you briefly, and then I shall operate upon this case by a method which seems to me most desirable and which has given us excellent results.

Congenital wry-neck is due to a birth injury of the sternocleidomastoid muscle, followed by hemorrhage in and around the muscle and its sheath, and followed by a histologic change in the structure of the muscle, a sort of fibrous degeneration in which the muscle cells are replaced by connective-tissue cells, with resulting contracture. The contracture is not limited simply to the muscle itself, for we have found in the cases that we have operated upon by the radical procedure, that I shall demonstrate to you this morning, that the deep cervical fascia which forms the sheath for the muscle is extensively involved and, in addition, there is, as one might expect, a marked change in the platysma myoides muscle, not due to the fibrous degeneration, but due to the fact that holding the head on one side markedly diminishes the size of the platysma myoides, although it does not, as a rule, alter its histology to any extent.

Very marked changes occur in the head and neck and even in the rest of the body of the patient who is the subject of this deformity if it is allowed to continue during the period of development. If, for instance, the baby is born with this birth injury and grows up to adult life, say twenty years of age, there is, in addition to the contracture of the sternocleidomastoid, a very marked atrophy of that side of the face. In the patient on whom I shall operate this morning this is very distinct, although the boy is only eight years of age, the left side of the face being very much larger than the right, which is the affected side. Owing to the deformity the patient carries himself in a peculiar way, trying to compensate by changes in the pelvis and in the spine for the abnormal position of the face and neck. This you will see very distinctly demonstrated in this boy (Fig. 327).

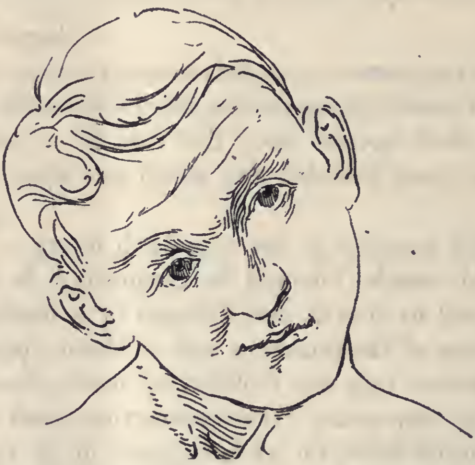

Fig. 327.—Wry-neck. Typical deformity. Note asymmetry of head and face.

There are, as you know, two different types of torticollis, or wry-neck. First, the congenital type, due to a birth injury and the resulting contractures. Second, the spasmodic type. They have absolutely no relationship and are two distinct and separate conditions. For a number of years these cases of congenital torticollis, I think, have been badly handled, simply doing tenotomies of the contracted muscle, correcting the position of the head after the tenotomy, placing it in an overcorrected position, and keeping it there for a time in a plaster-of-Paris cast, and later by a brace. This work gave rather unsatisfactory results, although it is a procedure that is still practised by many orthopedic surgeons. My attention was first called to a more radical and more satisfactory operation by an article by Mikulicz published about fifteen years ago. Mikulicz went very thoroughly into the subject, and suggested as the most satisfactory method of treatment the extirpation of the sternocleidomastoid muscle with the contracted deep cervical fascia.

When I first read the article it seemed to me rather an extensive operation, and I questioned its value as compared with the old tenotomy operation. However, I at once proceeded to put it into practice, with the most satisfactory results. Instead of being a radical operation the operation with good technic is, as a matter of fact, quite simple and very safe, and gives certainly very much better results than the old tenotomy operation followed by plaster of Paris and braces.

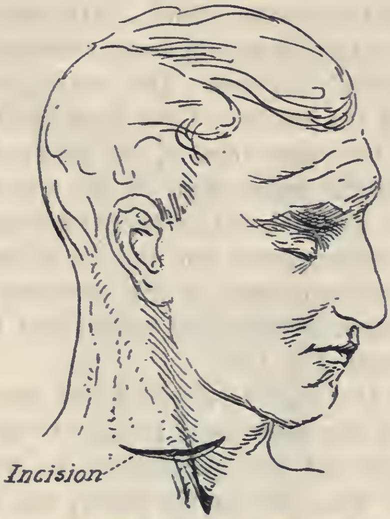

Fig. 328.—Head forced back and collar incision made.

The patient is now anesthetized and I shall proceed to do the operation. For a time I made an incision parallel to the contracted sternocleidomastoid. I have, however, been operating for several years with the transverse collar incision, such as we employ in goiter work, making a transverse incision in the neck, the center of which is opposite the contracted tendon and about 1½ inches above the sternoclavicular articulation (Fig. 328). The length of this transverse incision will necessarily vary with the size of the neck of the patient and with the extent of the contracture, but there is no necessity of making a small incision. If necessary I make an incision 5 inches in length. This divides the skin and superficial fascia, the platysma, and exposes to view the contracted sternocleidomastoid; note the contracted deep cervical fascia which forms the sheath of that muscle—this contracture of the sheath extends, as you see, for an inch or more on either side of the muscle. With a little force the fascia and muscle are put on tension and the lower two-thirds of the muscle freely and completely exposed. The contracted muscle is now divided at about the junction of the upper third with the lower two-thirds and the upper third of the muscle is left. This is done because in the upper third of the muscle is the spinal accessory nerve, which should be saved because it supplies not only the sternocleidomastoid but also the trapezius. In other words, we remove completely in this operation the lower two-thirds of the sternocleidomastoid muscle and the surrounding deep cervical fascia (Fig. 329).

As I divide the muscle you see I can move the patient's head easily back into the normal position or into any position. I carefully follow out the dissection so as not to injure the internal jugular vein, the carotid artery, and the pneumogastric, which are now exposed, and remove the muscle down to its point of attachment into the sternum and clavicle, both the sternal and clavicular origins being divided. Hemorrhage from a few small muscular and arterial branches are now controlled by ligatures and the wound is closed without drainage, care being taken not to suture the platysma myoides, but simply to suture the skin and superficial fascia. In the primary dressing, in order to obtain wound healing with the greatest comfort to the patient and with the least disturbance to the wound, the head may be dressed in the old deformed position.

The after-treatment is very important and very simple. I do not think that it is necessary to put the patient up in a plaster-of-Paris dressing immediately after operation, but we employ a starch bandage over our surgical dressing to give a certain amount of fixation, which adds to the comfort. After wound healing is complete the patient is instructed to exercise the neck and to sit in front of a mirror so that he can study the position of the neck, or, if it is a child, one of the parents instructs the patient how he is to hold the head and face. He is encouraged to do this, the mother or father keeping at him several times a day if necessary. If the child is old enough, we should arouse his pride in correcting the deformity so as to improve his personal appearance. If this is done persistently after the radical removal of the muscle, the child soon learns to keep the head in the right position and there is gradual improvement as far as atrophy of the side of the face is concerned,

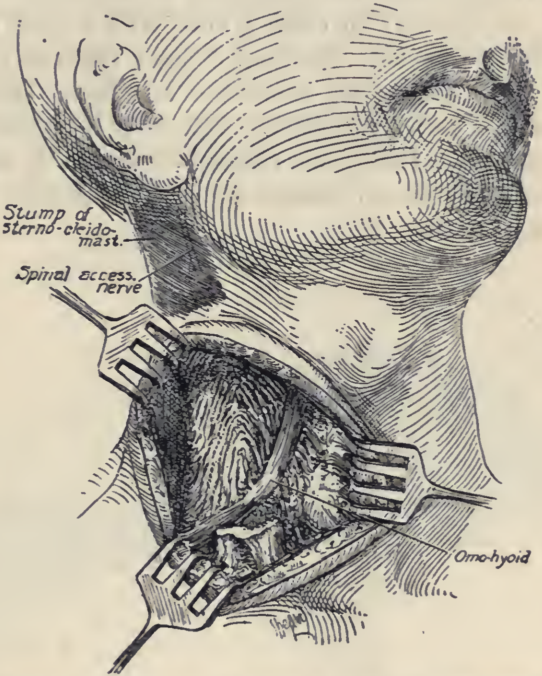

Fig. 329.—Dissection completed. Lower two-thirds of sternocleidomastoid removed, together with the fascial sheath.

although, of course, if the operation is done after the individual has attained full growth there can be little or no change in this respect.

I would like to emphasize the importance of this method of treatment as compared with the older and more generally adopted schemes. I would like to emphasize also the importance of recognizing this condition early and correcting it before other marked changes have occurred as the result of the deformity. It is a pity to allow a child with a birth deformity of this kind to have to continue without correction after the third or forth year. My experience has been that most of these cases are neglected until the deformity is marked and the atrophy so great that even though correction is made, the facial alterations due to atrophy persist as a distinct disfigurement thoughout life.

DESMOID TUMOR OF THE ABDOMINAL WALL

Summary: Pathology of desmoid tumors—diagnosis; treatment—excision not urgent, but usually desirable.

The second case that I shall show you this morning is a patient who comes to us with what we have diagnosed clinically as a desmoid tumor in the abdominal wall. My attention was first called to this condition by an article by Nicholas Senn about twenty-five years ago. I do not think that the condition is very generally recognized, and its pathology for a time was a matter of uncertainty and discussion. I believe we have operated on possibly a dozen of these cases in this clinic. All of those that we have seen have had very much the same history. They have all occurred in women. They have all occurred in women who have borne children, and they have developed some months after the woman has given birth to a child. The first thing that is noted is a tumor close to the median line, which, on careful examination, proves, as a rule, to be connected with

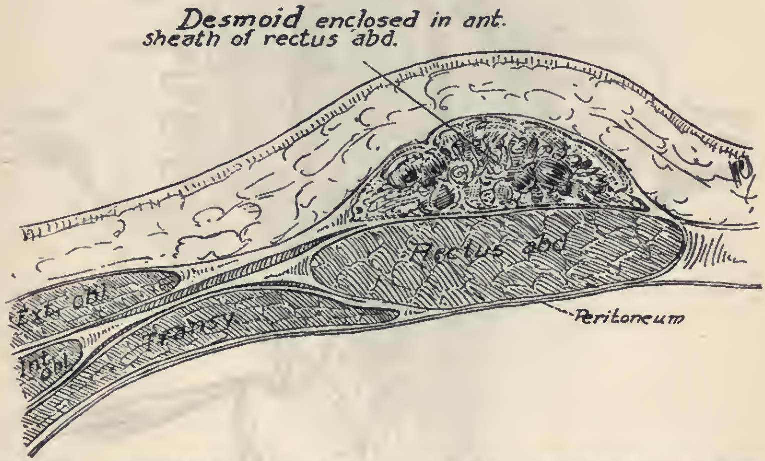

Fig. 330.—Transverse section through abdominal wall, showing location of tumor and its relation to rectus sheath.

the sheath of the rectus. These tumors vary in size from an English walnut to that of a fair sized apple. They are hard, firm, and painless, and not infrequently they are incorrectly diagnosed and are thought to be tumors within the abdominal cavity. As a rule, however, a careful examination will satisfy the surgeon that they are not in the abdominal cavity, but in the abdominal wall. Histologically, they are like fibroid tumors. Clinically, if not completely removed they have a tendency to recur like the recurring fibroids that were discussed by the old-time surgeons. They arrive at a certain size and then remain stationary. The indication for operation is relative and not absolute, because they can be carried by the pa-

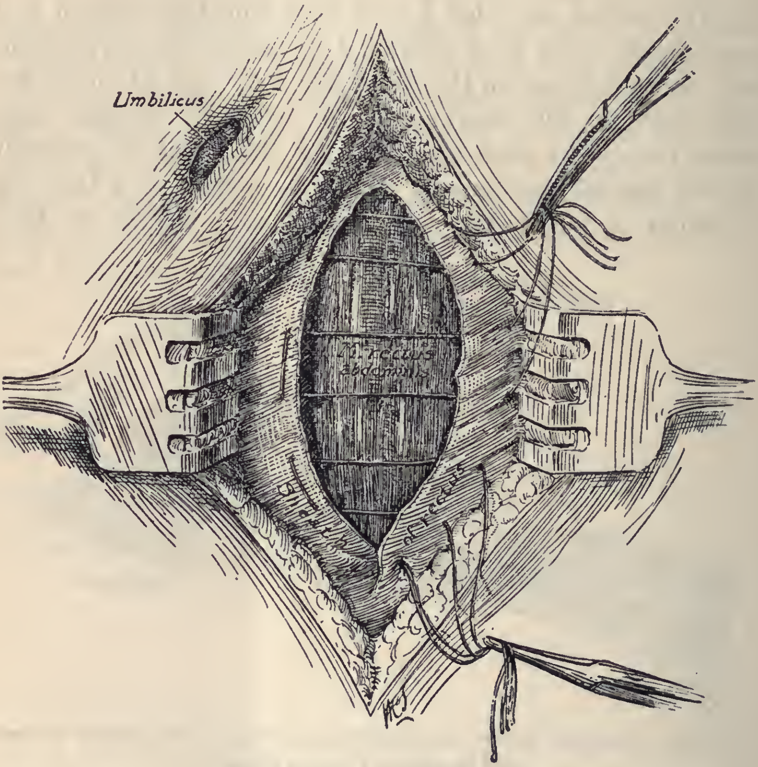

Fig. 331.—Tumor removed. Defect in sheath of rectus about to be closed by mattress sutures of catgut.

tient for a number of years. Those that I have seen have not been malignant. Some reports have described them as fibrosarcomas and classified them as slowly growing, slightly malignant tumors. Of course, the diagnosis cannot be made with absolute certainty without an exploratory operation, and I have, therefore, as a rule, felt called upon to operate upon these cases and remove the tumor for the double purpose of relieving the individual of the tumor and for making a definite diagnosis.

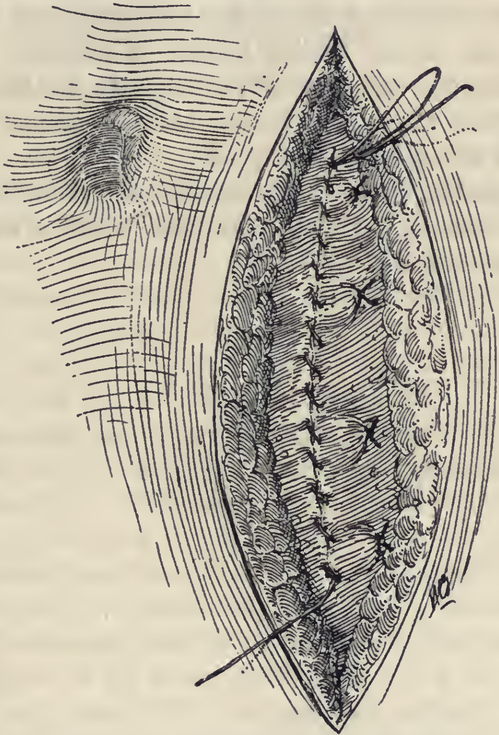

Fig. 332.—Closure of rectus sheath completed.

This is a young woman of thirty. She has had several children and she has noticed this tumor, which is about an inch to the left of the umbilicus, for the last six or eight months.

Under ether I shall now make an incision directly over the tumor, turn back the skin and superficial fascia, and expose the tumor, which is the size of an egg, irregular in shape, and which has been developed in the anterior sheath of the rectus muscle (Fig. 330). I cut quite wide of the tumor and remove not only the tumor but all that part of the anterior sheath of the rectus to which the tumor is attached. This leaves, as you notice, a large defect in the anterior sheath of the rectus, which I close with mattress sutures of catgut (Figs. 331 and 332). In order to make sure of keeping the edges of the sheath together during wound healing I shall, in addition, put in two mattress sutures of silkworm-gut through the sheath and through the superficial fascia of the skin. As you notice, I have not opened the abdominal cavity at all.

Postoperative Note.—Histologically, the tumor proved to be a typical desmoid. The patient went on to a complete and satisfactory recovery.

EPITHELIOMA OF THE LEG

Summary: Epithelioma developing in the scar of an old leg ulcer healed years previously following operative removal of varicose veins and skin-grafting of ulcer. Chronic irritation of old scars as a cause of cancer; great importance of failure properly to differentiate cancer from luetic lesions—necessity of early removal of section for microscopic diagnosis.

The third case that I shall show you this morning is a rather rare condition, a condition, however, which we have had the opportunity of studying pretty thoroughly in this clinic, and one which I think should be generally recognized more fully and completely than it has been.

This patient is one who was operated on years ago by Dr. Nicholas Senn, who was then in charge of the clinic. The patient had an extensive leg ulcer. There were, as etiologic factors to consider as causes of this leg ulcer, a varicose condition of the veins and a probable specific history. Under antispecific treatment and an operation on the veins the ulcer improved, but did not heal, and finally Senn dissected the ulcer out, covered it with Thiersch skin-grafts, and succeeded in obtaining a complete cure.

The patient was very much gratified and went about his work for a number of years without trouble. In the last year, however, there has gradually developed a condition in and about the old scar, which for a time he thought was of little moment, but which has grown into a serious and annoying condition. You will see (Fig. 333) at the site of the old skin-grafting there is now a raised-up, hardened, irregular lesion, looking very much like an epithelioma of the lower lip, and the patient gives very much the same history that one gets in the lip cases, that is, that scabs form over this lesion and then fall off, a new crust forms, and falls off, etc., but the lesion never heals completely.

We were quite sure of the clinical diagnosis, but I removed a small section of the growth and found it to be a typical epithelioma. We have seen a large number of these cases, that is, cases of epithelioma developing at the site of old pathologic processes, and have studied them with considerable care. These occur not only in the scar tissue of old varicose ulcers, but we have had them occur in the scar tissue of burns not shortly after the receipt of the injury, but years afterward.

There is a group of these cases that have been described in the literature as "Kangri burn carcinomas," occurring in individuals in certain parts of Asia, where in order to keep warm in the very high altitudes in cold weather the natives carry baskets about their body so arranged that they can fill the baskets with charcoal, that burns very slowly and gives a good deal of warmth. Falling asleep or under the influence of liquor, burns from these baskets are very common, and years afterward in the old age of the individuals many epitheliomas have developed in scars of these burns, leading to the description of these cases as "Kangri burn epitheliomas." But we have studied also the same condition in paraffin workers in connection with some of our big oil companies where paraffin is made. These cases have been described in the literature as "paraffin carcinomas." The sequence of events here is that these people working with crude oil from which paraffin is made have a skin irritation about their hands, forearms, and bodies, especially the scrotum, with resulting dermatitis and furunculosis. The workers themselves describe this condition as paraffin boils. The individuals recover from this dermatitis and furunculosis and no immediate bad effects are noted, but years later in a small proportion of these cases epitheliomas develop in the scar in these lesions and they are known as "paraffin carcinomas." We have also studied this same condition in the scars of lupus about the face and have handled a number of cases where, in the scar of the old lupus process, an epithelioma has developed.

I am inclined to believe that the most frequent and certainly the most important group of cases representing this same process is found in the development of epitheliomas in the mouth and tongue at the site of old syphilitic scars. Too great emphasis cannot be placed upon this fact, because hardly a week, certainly not a month, goes by but there is brought into this clinic a mouth or tongue carcinoma with this history of a slowly developing ulcer on the patient's tongue or mouth. In getting the clinical history of the case a clean-cut syphilitic history is found, or in examining the patient's blood a very positive Wassermann reaction is obtained, and the conclusion jumped at at once that the lesion is specific. The patient is then placed upon antispecific treatment probably for weeks or months with varying results; sometimes apparent temporary improvement which seems to confirm the specific diagnosis, but with no complete cure of the lesion, which continues and very often unfortunately extends so widely that it is difficult or impossible to make a radical operation, and then the simple thing that should have been done early in the history of the case is done and the diagnosis made definite, that is, a small section of tissue removed for microscopic examination. Time after time very intelligent and experienced medical men bring me cases with this same story. The answer, of course, is very simple. First, the mere fact that the individual has a syphilitic history does not make it at all certain that the lesions that he develops later are due to that disease. A man with syphilis is quite as apt to develop carcinoma; in fact, is more apt to develop carcinoma than an individual who has never had syphilis, and there is certainly nothing unusual in the coincident development of carcinoma in an individual with a specific history. The moral, of course, is that the Wassermann test or the patient's history should never be accepted as of any value in determining the character of one of these lesions; certainly not to the point of excluding the possibility of the development of a cancer. The work in our own clinic has made us believe that syphilis is one of the most common etiologic factors in the production of carcinoma about the tongue and mouth. I want to make a special plea to you gentlemen who are here this morning that in these cases you should insist upon determining the diagnosis absolutely by removing a section and obtaining a microscopic examination before submitting the patient to treatment, because so frequently the opportunity of curing the patient is lost by keeping him for weeks and months on antispecific treatment until the lesion extends beyond the primary focus and has become inoperable.

In this case this morning we have no evidence of the process having extended beyond the primary focus. I believe that it is still an epithelioma limited to this scar tissue. There is no glandular involvement. The man's general condition is good, and we believe, and of course hope, that the radical removal of this cancer by local operation will cure the patient. This might be done by radium or *x*-ray, but I think in massive epitheliomas of this kind it is much safer to remove the lesion with the knife.

I shall go quite wide of the lesion and dissect out the entire growth. The skin, superficial and deep fascia well out into the wound seems to be perfectly normal tissue (Fig. 333, 1). I have had the skin of the thigh on the same side prepared and we shall cover this area with Thiersch skin-grafts. These are made with a sharp razor flattened on one side, and taking the skin from the outer surface of the thigh just below the great trochanter. You see it requires about four grafts to cover the entire area (Fig. 333, 2). You notice that the little oozing that persisted before we put on the grafts seems to be checked by the application of the grafts. It is important in putting on grafts to see that they are flattened out perfectly and that any blood that is beneath them is forced out.

We shall dress this with perfectly dry dressings and fix them in place with adhesive strips and a starch bandage. If there is no reaction, we will leave the primary dressings on for a period of ten days. As a whole, we have been obtaining more satisfactory results in these skin-grafts with dry dressings than with moist dressings. Of course, if there is any reaction or if there is any evidence of discharge through the dressings, the dressings should be immediately removed, care being taken not to displace the grafts.

I want to say in this connection what I have said a good many times of late years in this clinic, that in skin-grafting you should be familiar with the fact that autogeneous grafts, that is, grafts taken from the same individual, with good technic will

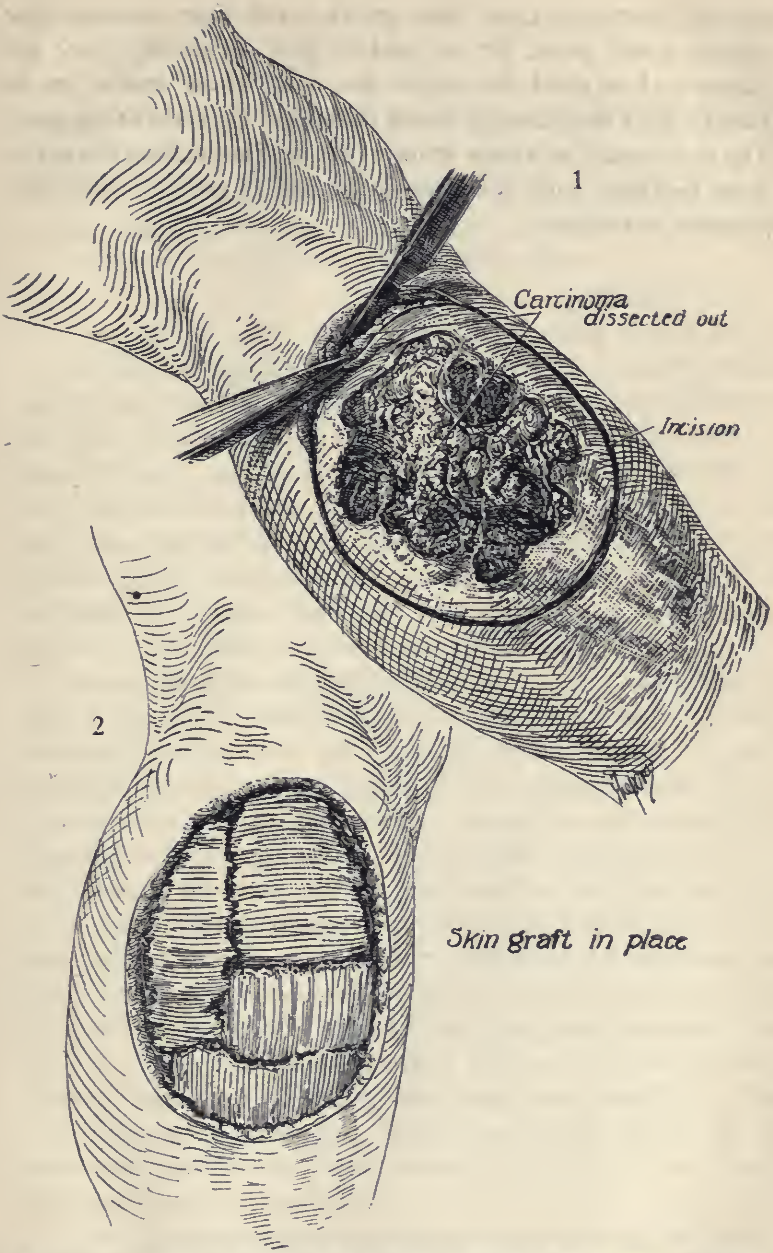

Fig. 333.—1. Removal of tumor by wide incision through scar tissue. 2. Defect covered with Thiersch grafts

almost invariably grow, that grafts taken from someone else almost never grow, for no matter how aseptically they are placed or how good the technic has been, at the end of ten to twenty days they usually break down and do little or no good. The fact should be widely known that in skin-grafting the grafts must be taken from the same individual in order to have any prospect of success.

ULCER OF THE STOMACH ON THE LESSER CURVATURE

Summary: Diagnosis—differentiation from cholelithiasis and carcinoma; technic of exploration of upper abdomen; treatment—excision versus medical management; indications for operation; postoperative care; results following gastro-enterostomy; transverse excision of large gastric ulcers.

July 22, 1918.

I WANT to operate upon a case this morning that comes to us with a questionable diagnosis. He has been under medical care for several years with pain in the upper abdomen presenting itself in two different ways. First, severe acute attacks at long intervals, and second, more or less stomach distress for periods of several weeks at a time, followed by intervals of about the same duration of complete relief. He is a man of thirty-eight. He gives a history that until about three years ago he weighed 140 pounds, before he had this trouble, and that he has lost about 30 pounds since that time.

In analyzing the evidence secured in the case I find that he has, in addition to the abdominal symptoms and loss of weight, a hemoglobin of about 70. Thorax and abdominal examinations are negative. Examination of the stomach contents shows a little more than normal acidity, no evidence of retention or obstruction at the pylorus. Fluoroscopic examination with a barium meal shows normal stomach and duodenal findings. He has a rather definite tenderness a little to the right of the median line, and he has given me a very definite history of three recent attacks of severe pain, which have all been very much alike, coming on very acutely, extreme agonizing pain requiring morphin and the use of the hot-water bag for relief, and lasting from a few hours to a day, not associated with vomiting or with any intestinal disturbance. Stool examination shows no occult blood and there has been at no time any history of vomiting blood from the stomach.

The character of these pains and the resulting tenderness, which is very marked immediately after the attack, seems to be quite typical of gall-stone colic attack, and if it were not for the other stomach symptoms that he has had there would be no question in my mind but that he was suffering from gall-stones in the gall-bladder without any obstruction of the cystic duct, because there is no distention of the gall-bladder and resulting tumor, and there has been at no time any evidence of jaundice. But in addition to these acute attacks he describes quite clearly that on a number of occasions he has had stomach distress coming on after meals, relieved by soda, and continuing for periods of three or four weeks at a time. These latter attacks, of course, are suggestive of duodenal or gastric ulcer. I have talked the matter over quite freely with him and told him that I believed the chances are that he has gall-stones in the gall-bladder, but that it might be a duodenal or gastric ulcer. I think from the long history of the case and absence of any filling defect in the fluoroscopic examination, the age of the patient, and the hyperacidity that we can clearly exclude any probability of a malignant process.

The patient is now thoroughly anesthetized and we shall make an exploratory and attempt to determine definitely the gross pathology that is responsible for the clinical symptoms. Because of the uncertainty of the diagnosis, lying between gall-stones and ulcer, I am making an S-shaped incision such as we make for gall-stone disease, extending from high up in the angle between the ensiform cartilage and the angle of the rib, down over the rectus muscle about parallel with the junction of the inner third and outer two-thirds of that muscle, fairly well toward the midline, extending down almost to the umbilicus and then sweeping outward to the right for about 2 inches.

Opening the peritoneal cavity, I find no adhesions and the cavity quite free. I lift up the gall-bladder and, as you see, it is blue and transparent and normal in size and appearance. I can empty the gall-bladder by gradual pressure without any difficulty. I can feel no stones. I examine the cystic duct and can find no evidence of any stone in the cystic duct. I introduce my index-finger in the foramen of Winslow and palpate the common duct between my index-finger and thumb, and find no evidence of stone in the common duct. On general palpation I find that it is quite normal. I therefore must conclude that he is not suffering from gall-stone disease, as I find no gross tangible evidence of such a condition. I now turn to the duodenum and examine the duodenum carefully. I find that it is quite normal. There is no evidence of any induration of a duodenal ulcer. I examine the pylorus and find that it is quite normal. It is patulous, as I can demonstrate by bringing my thumb and finger together, the index-finger pressing on the gastric side of the pylorus and my thumb on the duodenal side, and I can feel that the pyloric ring is perfectly normal and of good size.

I now examine the stomach. There is no evidence of any neoplasm. I find, however, as I carefully examine the lesser curvature of the stomach a distinct and definite whitening due to connective tissue, which has contracted the lesser curvature somewhat, and as I continue my examination I think I can feel the induration of an ulcer on the lesser curvature about 1½ inches from the pylorus. In order to be sure of this I carefully make a small opening in the gastrohepatic omentum just above the lesser curvature so that I can introduce my index-finger into the lesser peritoneal cavity and palpate the posterior surface of the stomach. In this way I can palpate very carefully, with one finger on the posterior surface and my thumb on the anterior surface, the lesser curvature at the point of this induration, and I can feel a very small crater-like ulcer at this point of induration. Of course there is a possibility but no great probability that this is carcinomatous.

There is one of two ways in which we can now handle this case. We can either make this operation purely an exploratory one, close the incision, and place the patient at once upon medical management for gastric ulcer, or we can resect this ulcer and remove the lesion completely and place the patient later on careful stomach management. That would make it improbable that any further ulcers would develop. Because of the long history of great suffering that this man has had and because it seems as though we could excise this ulcer without any great risk, I shall attempt to do this in preference to trusting to medical management alone.

Dividing the gastrohepatic omentum for a distance of about 2 inches between ligatures over the lesser curvature at the site of the ulcer, I now place a stomach clamp on each side of this area so as to keep out the stomach contents, and I cut out a saddle-shaped section of the lesser curvature including the ulcer (Fig. 334, *a*). Here is the specimen (Fig. 334, *c*), and you see that it is a beautiful example of a small punched-out peptic ulcer about the size of a pinhead. There can be no question now as to the pathologic diagnosis. It is not at all consistent with any malignant process. I ligate the gastric artery on each side of the point of resection and close this V-shaped opening with three rows of sutures, one through the mucosa, one through the muscularis and peritoneum, and the third, a Lembert suture (Fig. 334, *b* and *d*). The abdominal incision is closed without any drainage. The pads and sponges are accounted for and the patient is in very good condition at the close of this procedure, which, as you see, has not been a prolonged one.

In the after-management of a case of this kind we place the patient for the first twenty-four hours upon rectal enemata of normal salt solution, about 8 or 10 ounces every three or four hours. If the patient has much pain he is allowed a moderate amount of morphin. The patient is allowed to wash his mouth out frequently with a small amount of water, but he is instructed not to swallow it. At the end of twenty-four hours the patient is started on a small amount of water, about 1 ounce every hour, and if this is not followed by vomiting, it is gradually increased to 2 ounces every hour, and he is allowed an ounce of milk or an ounce of broth every two hours. This is gradually increased until a fair amount of liquid nourishment is given. After the broth and milk are started we believe it is very desirable to give the patient a small amount of bicarbonate of soda and calcined magnesia in powder form about twenty minutes after the milk is taken. This relieves the acidity and stimulates peristalsis and, I believe, lessens the tendency to vomiting. The patient, after the immediate effects of the

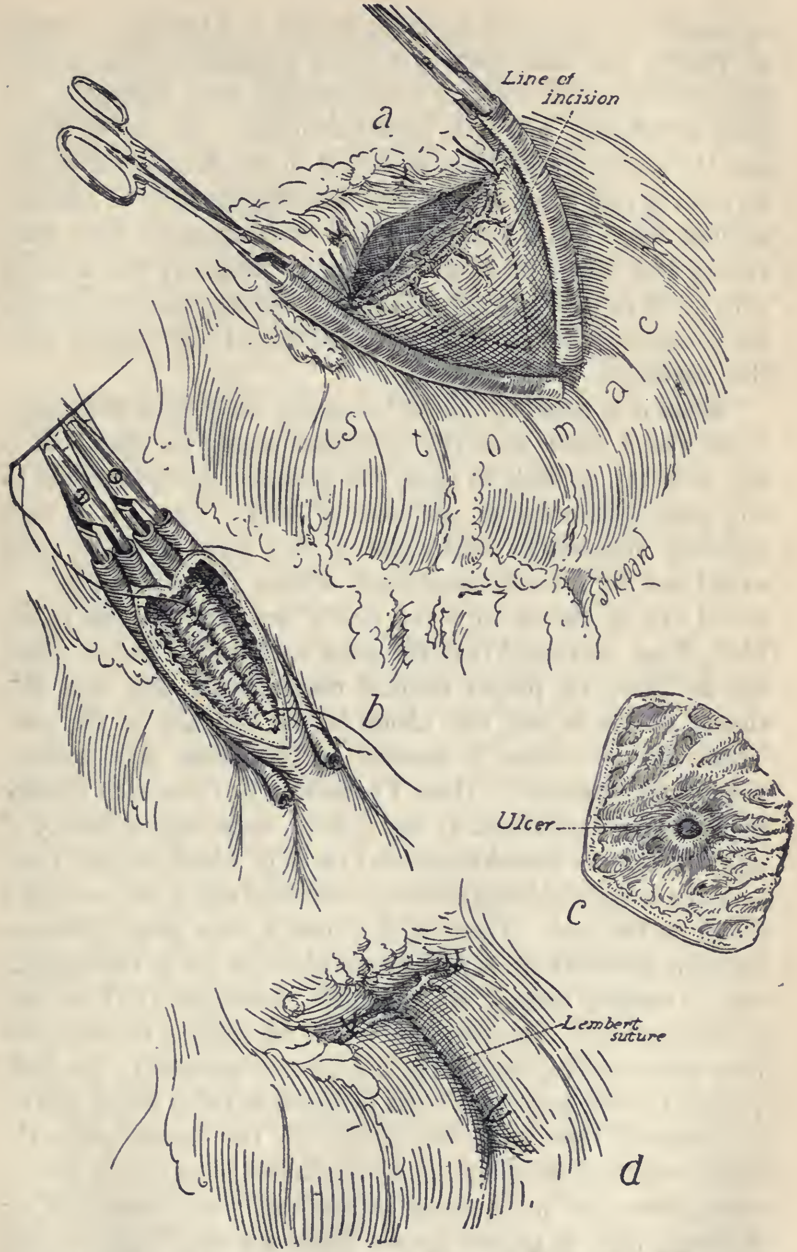

Fig. 334.—*a*. V-shaped excision of ulcer area. *b*. Closure of defect following excision by usual three-layer suture. *c*. Appearance of excised tissue. *d*. Closure of defect completed.

operation are over, that is, on the second or third day, is placed on exactly the same sort of medical management for gastric and duodenal ulcer that we would employ if no operation had been undertaken, and it is persisted in for a number of weeks and the same care is taken in regard to the diet and after-history of the case as though we were handling an ulcer in a purely medical way. If the patient persists in vomiting for more than twenty-four hours we do not hesitate to wash out the stomach with great care in cases of this kind. We feel that the sutures are competent and we have not experienced any trouble from this procedure.

When it is possible to resect a gastric ulcer with little additional risk I think that this operation should be done. It is not, however, possible to apply the radical resection method to any great percentage of our cases of gastric ulcer. If it were generally adopted it would give a very great mortality and would not be a most satisfactory scheme of management. I would like to discuss with you briefly my views on this point. First, I am convinced that the great majority of gastric ulcers can be cured by proper medical management, and that this should always be our first choice in the handling of the case. There are, of course, a number of conditions that demand surgical management. These I believe to be cases with definite hypertrophic obstruction at the pylorus, cases with a history of repeated serious hemorrhages and cases in which medical management in spite of being efficiently followed out is not successful in curing the case. There is, of course, a very great difference between duodenal ulcers and gastric ulcers as far as the application of surgical therapy is concerned. Personally, I think that a duodenal ulcer more frequently calls for surgical management than gastric ulcer, because it is a greater menace to the individual, the risk especially from perforation being much greater in duodenal than in gastric ulcer. In the second place the results obtained by the generally employed operation of gastro-enterostomy are much more satisfactory when employed for duodenal than in gastric ulcer. There are some surgeons and medical men who take the position that gastro-enterostomy is of little or no value in ulcers in the stomach proper. I cannot, however, agree with that position. I believe that the majority of cases of gastric ulcer can be cured by a well-functionating gastro-enterostomy. If expressed in figures I should say that in duodenal ulcer the gastro-enterostomy would be effective in 90 per cent. or more and in about 50 per cent. of the gastric ulcer cases. There is a class of huge indurated ulcers of the stomach which in a certain proportion of the cases resist all methods of medical management and which must be handled by excision if it is anatomically possible. The transverse excision of a large gastric ulcer is now an accepted and standard operative procedure. The operation is practically an excision of a through-and-through segment of the stomach, including the ulcer and the area beyond, well into healthy tissue, and the large wound in the stomach closed by suture. This is necessarily formidable and carries a good deal of mortality with it. There are a number of cases with huge gastric ulcers in which excision is anatomically exceedingly difficult, and I am, unfortunately, able to show you a specimen of this kind which we have just obtained from the postmortem examination of one of my classmates in medical college. I had been very much interested in this case because of the fact that the patient was an intimate friend of mine for a great many years. I would like to show you this specimen and give the history of the case, as I think it is peculiarly interesting and instructive.

You will see that this specimen (Fig. 335) shows a huge saddle-shaped ulcer about 1¾ to 2 inches in its various diameters at the lesser curvature of the stomach very close to the esophageal opening. This patient came to my service about three weeks ago suffering from marked stomach distress and great loss of weight and increasing weakness. His hemoglobin was low. He was able to walk about, had some pain immediately after meals, and had occult blood in the stools, normal acidity or slightly higher than normal acidity, no tumor to be felt, marked tenderness just below the ensiform cartilage. In the fluoroscopic examination a filling defect was evident and the probable clinical diagnosis of carcinoma was made. We felt, however, that it would be well to place him for a short time on ulcer management. This was done, with rather marked relief

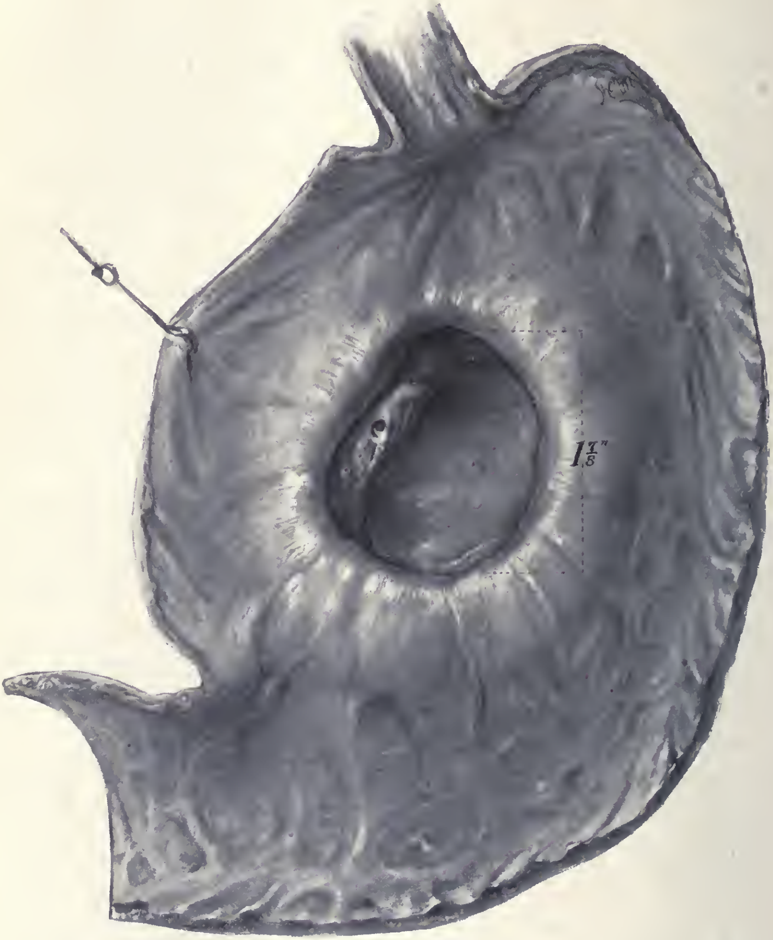

Fig. 335.—Huge crater-like ulcer on lesser curvature which produced a filling defect in the radiogram simulating carcinoma; death from hemorrhage. Note eroded vessel in floor of ulcer.

apparently from the standpoint of relieving his pain. He began to vomit, however, and on several occasions the vomitus was bloody. He steadily and rapidly went down hill. The condition was so bad that I did not feel warranted in making an exploratory operation, and after being under our observation for about three weeks the patient suddenly became very weak with every evidence of internal hemorrhage, lapsed into coma, and died.

The postmortem examination showed this very deep, punched-out ulcer on the lesser curvature, and on careful examination I think we can find the open mouth of the vessel which produced the fatal hemorrhage. The intestinal canal was full of blood.

As we analyze the facts in this case it is particularly instructive because the evidence seemed to be in favor of carcinoma, and yet it was an ulcer pure and simple. I am glad that we placed him on ulcer management, because I think that was the wisest thing to do from the standpoint of the symptoms, and the postmortem findings confirmed the wisdom of that course. In analyzing the facts I naturally asked myself whether it would have been wise to have operated on this case or not. Evidently it would have been impossible to have resected this ulcer because of the fact that it encroached on the esophagus, and it would have been impossible to have made a closure, and I doubt very much whether gastro-enterostomy would have been of any more service here than was proper stomach management, but, of course, that is simply a matter of opinion.

In connection with this case I would like to make this statement, that as we study more and more of these stomach cases the difficulties of making absolutely a diagnosis between ulcer and carcinoma in a very considerable group become more apparent. One might, I think, say this, that a typical stomach ulcer case and a typical carcinoma of the stomach case can be clearly diagnosed with a good deal of certainty, but there is a very considerable group illustrated by the case which I am now discussing in which the findings are such as to make it difficult or impossible to differentiate between carcinoma and ulcer. We thought in this case that the diagnosis was most certain to be carcinoma, and yet it proved to be ulcer. We have a large series of cases in which even at the time of operation we have felt that the tumor-like lesions were clearly carcinomatous and where we have made a palliative gastro-enterostomy, and where we have found the patient alive and well years after, with a complete disappearance of the tumor, demonstrating that the diagnosis that was made even after opening the abdomen was erroneous.

Postscript.—Microscopic examination of the segment removed at operation showed that it was a peptic ulcer with no evidence of malignancy. The patient went on to a very satisfactory recovery and has rapidly gained weight and strength since the operation.

ABSCESS OF THE LUNG—AN IMPORTANT SEQUEL TO TONSILLECTOMY

Summary: Diagnosis of lung abscess—importance of the x-ray and exploring needle; technic of operation—combination of local anesthesia and the electric cautery; necessity for prolonged drainage; etiology; cases following tonsillectomy.

July 24, 1918.

I WANT to present to you this morning a patient upon whom we have made a clinical diagnosis of abscess of the lung. We shall examine the thorax carefully with an exploring needle and attempt to locate the abscess, and, if we are successful in doing this, proceed with the operation for the purpose of securing thorough drainage.

This young man is a lieutenant in the United States Army. About two months ago he had a rather severe attack of pneumonia from which he made a slow and incomplete recovery. Some cough persisted and some dulness on the left side in the lower lobe, and an irregular temperature. The attending physician advised that he be sent to Colorado to recuperate. While in Colorado he became suddenly worse and the medical attendants who were called made a diagnosis of lung abscess and urged immediate operation, which was undertaken. This was done under ether anesthesia, the eighth rib resected in the axillary line, and the pleural cavity opened. No free pus was found in the pleural cevity and the lung at once collapsed. The patient's condition became extremely bad and the operation was discontinued and the incision completely closed. This left an operative pneumothorax. The wound was clean and healed aseptically; the air in the chest was soon absorbed, and for a time there was some improvement in the man's condition. It was thought wise, however, to bring him back to Chicago, and we have had him in the hospital now for several weeks on my service and we have had several of my colleagues in consultation on the case. The x-ray does not show, definitely, a lung abscess. It shows, however, a little above the diaphragm a shaded area which is unlike the normal lung and suggestive of some induration of the lower part of the lower lobe (Fig. 336).

The general clinical picture is suggestive of lung abscess in the sense that he has an irregular temperature, shooting up as high as 104° F. at times, with cough and some expectoration, though not in large amounts, and nothing else to account for these findings. The sputum has been examined and no tubercle bacilli have been found.

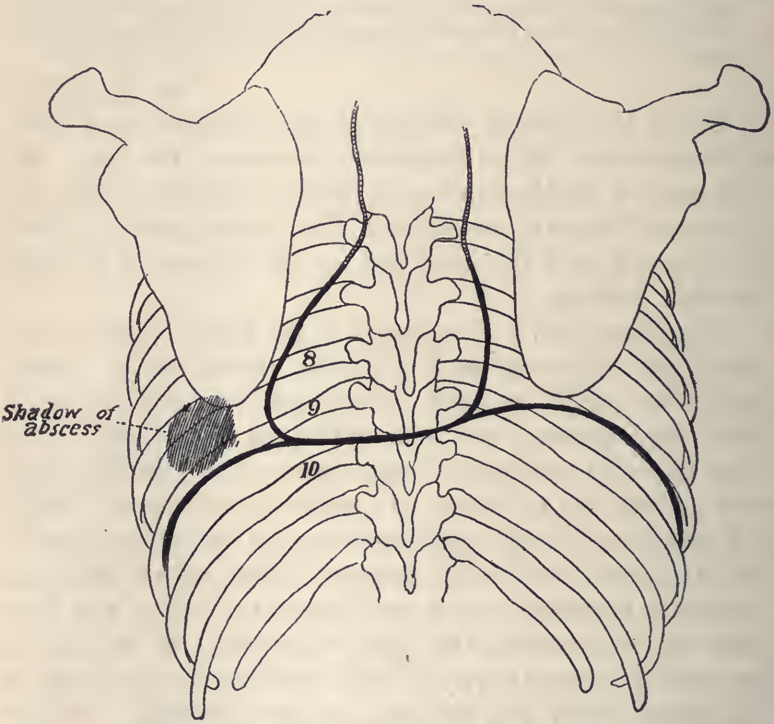

Fig. 336.—Abscess of lung. Diagram illustrating roentgenogram of chest.

I shall operate on this case under local anesthesia and shall use apothesin, which I have been using with great satisfaction now for some months. I shall use this also in the minor procedure of exploring the chest for abscess with the needle. I inject about 1 dram of $\frac{1}{2}$ of 1 per cent. apothesin. In the intercostal space between the eighth and ninth ribs in the axillary line I introduce the exploring needle. This needle is of moderate size, and as I withdraw the piston I find that no fluid of any kind is drawn into the barrel of the syringe. I can feel, however, by moving the needle very gently that it is in the free cavity and not in firm tissue. Withdrawing this needle and employing one of larger caliber and now withdrawing the piston, you see that I draw into the barrel about a dram of yellow mucoid-like pus. That explains definitely that we are in a cavity containing pus. Leaving the needle *in situ*, I now infiltrate the soft tissues for a distance of 3 or 4 inches in the eighth intercostal space with apothesin solution, and incise the

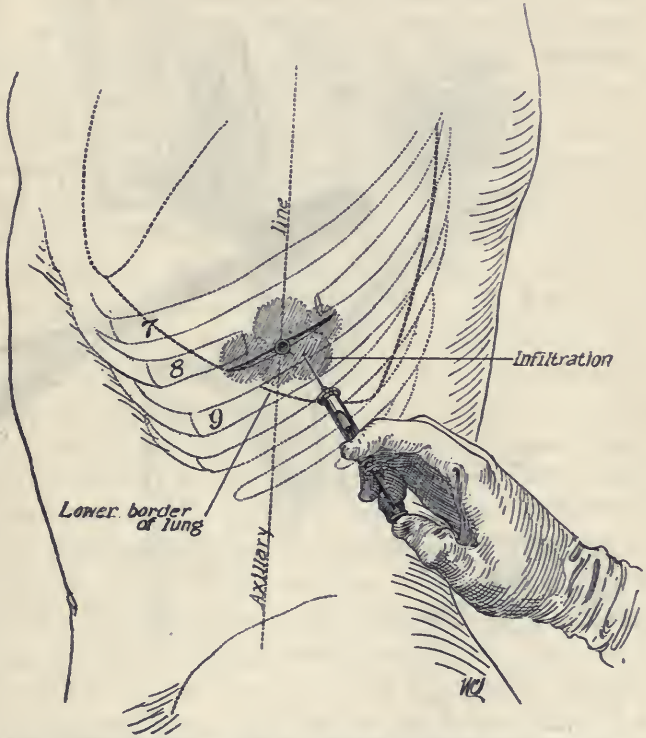

Fig. 337.—Exploring needle in position; injection of local anesthetic.

tissues freely for a distance of about 2 inches on each side of the needle (Fig. 337). I then take this electric cautery, which is an admirable instrument, and burn a good-sized canal, about as big as my little finger, around the needle and into the abscess (Fig. 338). The fluid that comes out is rather a mucoid pus, and not in very large amounts.

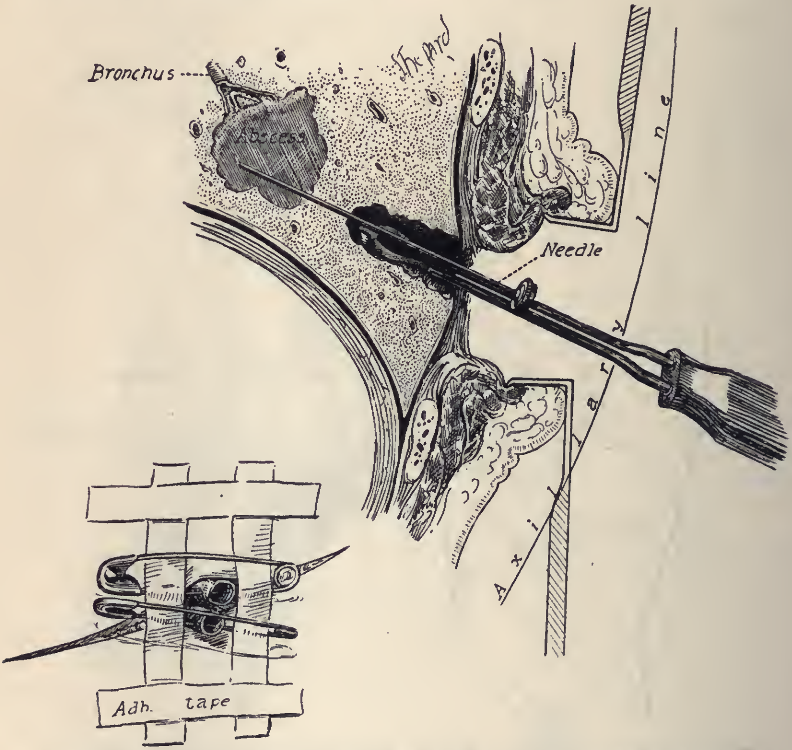

Fig. 338.—Cavity located by exploring needle. With the needle as a guide a suitable tract for drainage is established by means of the electric cautery. *Insert:* Drainage-tubes in position, anchored by safety-pins and adhesive plaster strips.

I now introduce two drainage-tubes or, rather, two No. 14 English size soft-rubber catheters, which I have vaselined, gently through this canal into the abscess cavity, using no force whatever. They run in for a distance of about 3½ inches, and a good size safety-pin is put in each one of these rubber catheters so as to prevent its slipping either in or out. A strip of adhesive is passed through these safety-pins so as to hold them in position and a copious gauze dressing is applied externally (Fig. 338, insert).

AFTER-HISTORY OF CASE

The after-history of this case is proving to be very interesting. The temperature at once diminished and finally became normal. The man improved very much in weight and strength, in three weeks gaining 15 pounds. The discharge from the abscess was quite copious and continued of the same mucoid-pus character. There was a marked dimunition in the expectoration and the cough finally ceased almost entirely.

About four weeks after the operation I had the patient come back to the hospital and I injected some bismuth paste, a small amount of it, through the tube with two objects in view, one to take an *x*-ray picture of the exact extent of the cavity. The second object was that it was possible that the bismuth paste would assist in curing him. When I injected about a dram of the bismuth paste the patient began to cough rather violently and I discontinued it. I sent him down to the *x*-ray room and obtained an *x*-ray picture. I found the picture showing that the paste was limited to the small tract of the tube and then passed directly into a bronchus, and the paste could be seen thickly filling the two or three small bronchi just behind the tube. The injection of the paste proved to be very distressing, in that it was followed by severe coughing which persisted for four or five hours, and by a cessation of the discharge for twenty-four hours, and then a very sharp increase in the amount of discharge and with a rise in the temperature. These acute symptoms, however, disappeared in four or five days and the patient is now on the road to recovery in the sense that he is increasing in weight and strength. His cough has disappeared, but the mucus-like discharge continues in rather large amounts, requiring changing the dressings two or three times a day. There is here a fairly direct communication between the abscess cavity, which is now reduced to a mere fistulous tract, and the bronchus.

The further management of the case is at this time difficult to determine. I think the best plan will be to make no further attempt at closing the cavity with bismuth paste, but simply to secure free drainage and attempt to build up the general health of the patient, and probably be satisfied for a great many months or even years with his wearing a tube and maintaining good drainage.

We have had quite an experience with these abscesses of the lungs, and many of them are best handled by frankly accepting the position that we must drain them indefinitely. Certainly in half of the cases of lung abscess which we have operated upon the patients have been in better condition with permanent external drainage than where an attempt was made either with paste or by operative procedure directly applied to the lung to cure the external fistula. I would like to emphasize this fact, because naturally the surgeon desires to get rid of the permanent fistula in a case of this kind, and yet frequently it certainly is an unwise thing to do for the best interests of the patient. I have a number of patients who are perfectly comfortable with external drainage from a lung abscess with a slight amount of discharge, and who have been in this condition for years. On the other hand, where I have made an attempt to cure the case by direct operative interference, such as the resection of a number of ribs and allowing the chest wall to collapse with the hope that this will obliterate the lung cavity, or where I have used bismuth, I have, unfortunately, in many cases done more harm than good. To be sure, we have a large series of cases in which the results have been most satisfactory where we have drained the lung abscess, and have had a complete and perfect cure without the necessity of persistent external drainage.

I would like in connection with this case to say a word in regard to the anesthetic to be employed. We have been able to so perfect our technic of local anesthesia that in almost all of these thorax operations for lung abscess it has become the anesthetic of choice, very much safer and very much better than a general anesthetic, or even any pressure cabinet scheme or intratracheal ether anesthesia. I have discussed this subject with several of my colleagues who have been interested in the subject of pressure cabinets and intratracheal anesthesia, and I am convinced from my own operative experience that in all but a very small group of cases one can obtain more satisfactory results with local anesthesia than in any other way. If the technic is good, there is little or no pain experienced by the patient.

I am fortunate in being able to present to you this morning another lung abscess case which has especially interesting features. It is not now an operative case, but I am presenting it to you because I want to give you the benefit of the instruction which we ourselves have been able to obtain from a study of this patient.

This woman is thirty-five years of age, the mother of six children. The woman had always had excellent health until about three months ago, when she was suddenly seized with acute abdominal pain. A very good surgeon was called, who made a diagnosis of appendicitis. The surgeon, however, was not called until several days after the onset of the symptoms. He advised immediate operation, and this was done. On opening the peritoneal cavity a ruptured, gangrenous appendix was found with a large accumulation of pus. The gangrene had extended to the wall of the cecum. The patient was in extremely bad condition. The pus was mopped out. It was impossible to suture the friable gangrenous cecal wall. Drainage-tubes and gauze packings were introduced and the patient made an immediate recovery from threatened death from general peritonitis.

There was left, however, a large fecal fistula in the cecum. She improved for a number of days. The temperature, however, never returned to normal, and at the end of three or four weeks when I saw her she had a very large fecal fistula out of which poured almost all of the fecal contents, although she occasionally had a bowel movement through the rectum. She had a persistent temperature varying from 101° to 103° F. and was very weak. It was evident that if the condition persisted for any great length of time it would be fatal (Fig. 339).

I examined the case with the attending surgeon with extreme care. We could find no evidence of an abscess in the abdominal cavity or in the pelvis. There was, however, some dulness over the right lower lobe. The *x*-ray picture showed no evidence of empyema, but an indefinite shadow over the dome of the diaphragm on the right side (Fig. 340). She complained of no pain and no tenderness, so I made a diagnosis of probable subphrenic abscess or abscess in the lung. After she was transferred to my service I very carefully explored the right side of the chest with an exploring needle, but could not locate any pus. I could determine, I think beyond question,

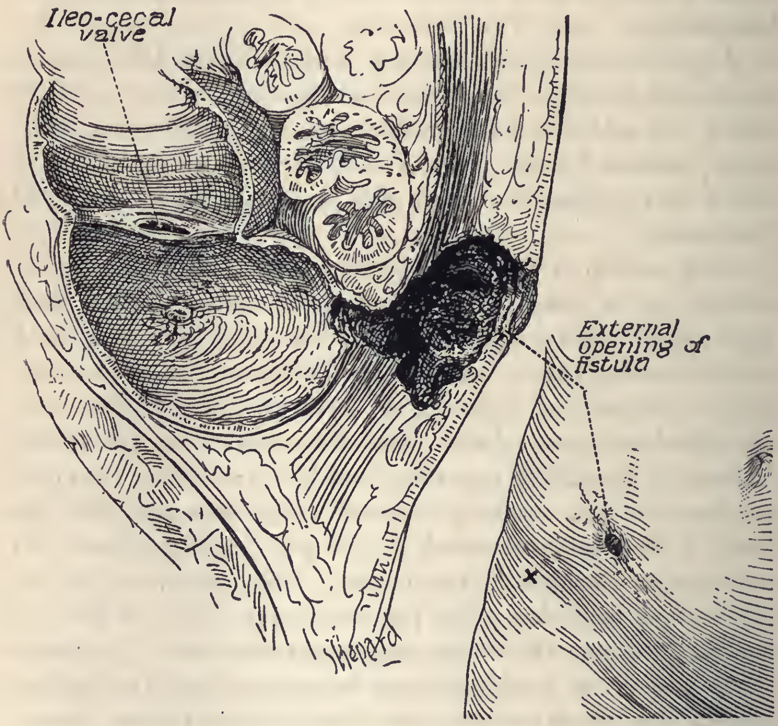

Fig. 339.—Section in sagittal plane illustrating size and course of fecal fistula.

that there was no empyema. I could not, however, make out the presence of any pus in the subphrenic space, which I thought was the probable clinical diagnosis. I also at that time explored the pelvis very carefully bimanually, as one of the attending medical men thought the persistent temperature was due to a pelvic abscess, but none was found. I then came to the conclusion that she probably had a septic thrombus in the portal vein or in the radicals of the portal vein, or else she had a small subphrenic abscess or a small lung abscess which I could not find with a needle. It is clearly our duty not to make a radical operation in these obscure cases unless we can locate pus definitely at some point. I followed this rule, which I regard as a wise one, in this case:

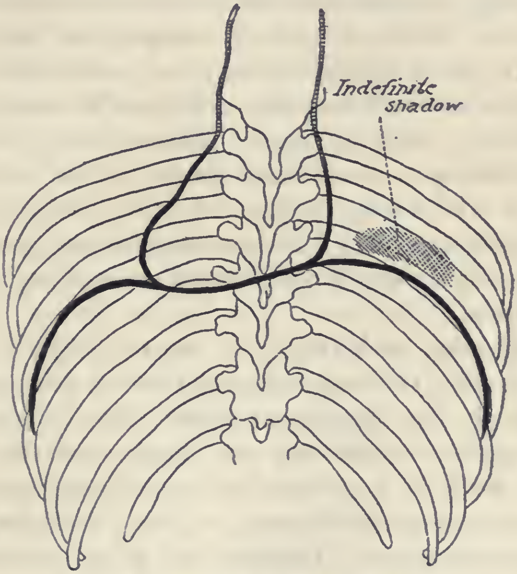

Fig. 340.—Diagram of roentgenogram.

I treated the fecal fistula with soft bismuth paste, which we used twice a day, and gradually the soft tissues contracted at this point and the fecal contents were passed more and more through the rectum and less and less by the fecal fistula, until we succeeded practically in preventing, with the bismuth paste, almost all escape of feces from the fistula. I gave instructions to have the patient take all the nourishment possible and to have her put in a wheel chair every day and taken on the roof and kept in the fresh air.

I re-examined her from time to time to see if we could detect the presence of any definite tangible focus of suppuration. The woman's general condition remained about the same for several weeks and then she developed a rather severe persistent cough. This was followed by very free purulent expectoration in very large amounts and an immediate diminution in the temperature. Within a week the temperature came down to normal and the patient is making a very satisfactory recovery. There can be no doubt but that in this case the woman coughed up pus from a small subphrenic abscess which we have been unable to detect, or from a lung abscess. I am rather inclined to think it was a lung abscess and not a subphrenic abscess, because there was never a foul-smelling or fecal odor, although that fact of itself would not warrant our making an absolute differentiation.

In connection with these two cases I might discuss with you very briefly the lung abscesses that we have had on our service in the last three years which have followed what is regarded usually as the safe and simple operation of tonsillectomy. We have had certainly ten to a dozen lung and brain abscesses following tonsillectomy. I think that this should be more generally known. Tonsillectomy is by no means a safe operation. It carries with it very considerable amount of risk, and the greatest risk is that of subsequent lung or brain abscess. I have been astonished in discussing this subject with a number of throat specialists to have them tell me that they have never had this accident occur in their work and that they had not seen any of these cases. Naturally, cases of this kind would drift into a large metropolitan hospital, as many of them are obscure, and they would find their way into an institution where they could obtain the services of a consultant and the advantage of obtaining expert *x*-ray investigation, etc. I suppose that that fact will account for our being able to report ten to a dozen of these cases occurring within a period of two or three years in the surgical service of the Presbyterian Hospital.

The exact route of infection that occurs in these cases is not easy to establish in every case. There are certainly two possibilities, one that the infection occurs as a direct aspiration, pus and blood from the tonsil at operation being inspired into the trachea and bronchi and finding its way into the lung, and there becoming a focus for lung abscess. I am inclined to believe that this is not the usual sequence of the abscess and that most of these lung abscesses following tonsillectomy are hematogenous, that the infection occurs at the site of operation and obtains access to a vein, and is carried as a small infected embolus to the heart, and is admitted through the pulmonary artery into the lung. As an argument in favor of this route I would like to submit the fact that, in addition to abscesses in the lung following tonsillectomy, we have had several cases of brain abscess develop, some of these without any previous lung abscess occurring in the cases, and others where the history was that of tonsillectomy, then a lung abscess, and following the lung abscess the development of an abscess in the brain. Many of these cases are fatal. They are all serious. They should be handled in the way which I have just handled this first operative case this morning, by determining with the *x*-ray and exploring needle the location of the abscess and securing drainage by operation with the electric cautery under local anesthesia. From our experience with these cases I want to decry the employment of a general anesthetic, and emphasize again the importance of continuous drainage of the lung abscess for a long period of time.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

A CLINICAL LECTURE ON THE ACUTE ABDOMEN

Summary: Acute lesions of the spleen; differentiation of torsion of the omentum, acute suppurative epiploitis, occlusion of the mesenteric vessels, acute infections of the mesenteric lymph-nodes. Meckel's diverticulitis. Intestinal obstruction. Sigmoid diverticulitis. Infections of the cecum and appendix. Peritonitis. Acute affections of the genito-urinary tract. Extra-abdominal causes of acute symptoms. Exploration of patient presented at beginning of lecture—discovery of appendiceal abscess in an unusual location. (The patient was a man of fifty, never ill until two weeks prior to admission to the hospital. He had been suddenly seized with pain in the right side of the abdomen and around the umbilicus; on account of his high temperature, rapid breathing, and upper abdominal rigidity a diagnosis of thoracic disease with reflex abdominal symptoms had been made by another surgeon.)

We have finished our discussion[1] of the acute lesions of three of the upper abdominal viscera, viz.: (1) liver and bile tract, (2) stomach and duodenum, and (3) pancreas. We will now consider the acute lesions of the remainder of the abdominal viscera and any other conditions, such as tabes, vascular crises, spinal lesions, hysteria, etc., which may give rise to acute symptoms simulating those of the abdominal viscera. The first structure whose acute lesions we will consider is the spleen.

(*a*) *Acute perisplenitis* occurs so rarely as a primary condition that a separate consideration may be omitted.

(*b*) *Abscess of the Spleen.*—This is a comparatively rare affection. With the exception of abscess occurring during typhoid and as a metastasis in pyemia, nearly every non-traumatic abscess of the spleen is secondary to some suppurative process in the course of the portal vein. The most prominent symptoms are pain, rigidity, and tenderness in the left upper quadrant of the abdomen, accompanied by fever. Careful examination and a good clinical history will usually enable one to find the seat of the primary infection.

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[1] The first part of this clinical lecture upon the acute abdomen was published in the Surgical Clinics, August, 1918, to which the reader is referred for information in regard to the classification of acute abdominal affections used by the author.

(*c*) *Torsion of a Movable Spleen.*—This condition is also rare, but occurs often enough to be thought of in the differential diagnosis of acute lesions of the upper abdomen. The symptoms are quite similar to those of the twisting of the pedicle of other structures, such as the kidney, ovarian cysts, pedunculated uterine fibroids, etc.—viz., severe pain, rigidity and tenderness, localized in the case of the spleen in the left upper quadrant, vomiting, more or less shock.

If the spleen is extremely movable, as in a recent case reported by Saliba,[1] where it was found in the true pelvis, the strictly local signs, such as pain, tenderness, and rigidity, are found lower down.

Let us next consider the acute affections of the omentum and mesentery, including the vessels of the latter. These include the following:

(*a*) Torsion of the omentum.

(*b*) Acute suppurative epiploitis.

(*c*) Occlusion of the mesenteric vessels (thrombosis and embolism).

(*d*) Acute infections of the mesenteric lymph-nodes.

(*a*) *Torsion of the Omentum.*—This occurs in an acute and a subacute or recurrent form, and is due to a twisting of the entire omentum or only a part of it upon its long axis (Fig. 341). In the majority of reported cases it is associated with a hernia, the omentum forming a portion of the contents of an inguinal hernia which is irreducible because of the adherent omentum. From two to ten complete twists may be present and the torsion may be around one or two fixed points. As a result of the torsion circulatory changes, varying from extreme congestion to gangrene, may occur. Clinically, there are two types. The principal symptoms are quite similar in both of these, viz., those of acute strangulation of any intra-abdominal viscus differing only in one respect, viz., localized rigidity and a tender mass, if a hernia is present. The signs of ileus are less marked than in a strangulated hernia, while, on the other hand, the clinical picture of the acute abdomen develops more rapidly than in the case of appendicitis, for which torsion of the omentum has been most frequently mistaken. To recapitulate, if a

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[1] Surg., Gyn., and Obst., 1918, 27, 73.

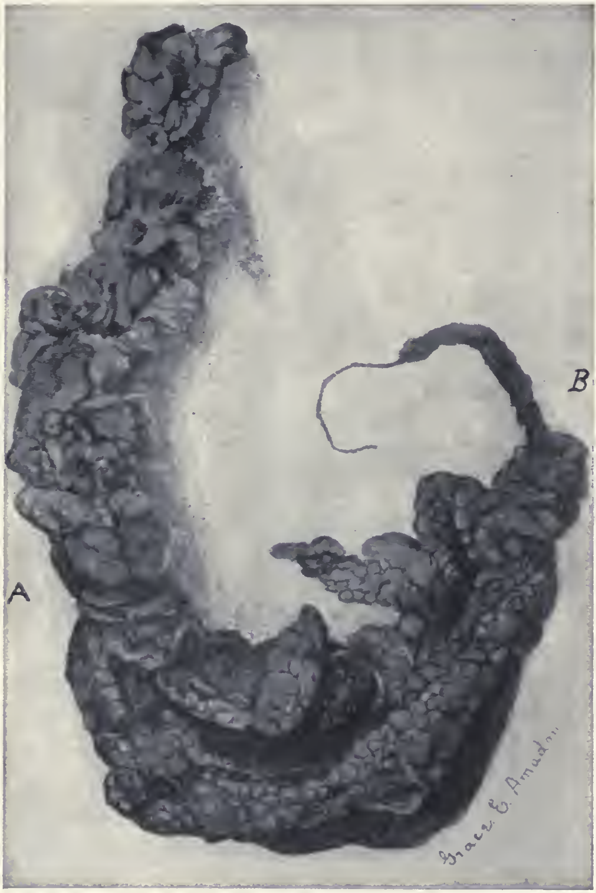

Fig. 341.—Torsion of the entire great omentum: *A*, Pedicle or point of constriction above the strangulated omental mass; *B*, greatly stretched adhesions twisted into a slender cord-like structure (Fuller).

hernia is present, we feel a tender mass extending upward from the corresponding inguinal or femoral region accompanied by sudden severe pain, vomiting, and other signs of an acute abdominal crisis. If no hernia is present the diagnosis is far more difficult because the tumor mass may not be felt, and we have only the symptoms of acute strangulation of an intra-abdominal viscus. In the recurrent form the attacks may subside in a few hours to a day or two, the condition often being diagnosed as recurrent appendicitis, it being almost impossible to make a diagnosis in the absence of a palpable mass extending upward from an irreducible hernia.

(*b*) *Suppurative Epiploitis.*—Hessert[1] has recently reported two interesting cases in which acute abdominal symptoms (pain, fever, localized rigidity and tenderness, and a mass) appeared after inguinal herniotomies. At the secondary operation multiple foci of infection (abscesses) were found in the omentum and were, no doubt, due to infected ligature material. I have only referred to these cases because this condition must be considered in the differential diagnosis of the acute abdominal symptoms following any operation in which the omentum required ligation.

(*c*) *Occlusion of the Mesenteric Vessels.*—Since we cannot differentiate clinically as to whether the mesenteric artery has been obstructed by an embolus or the mesenteric veins occluded by a process of thrombosis, I agree with Eisenberg and Schlink,[2] who advocate the use of the term "mesenteric vascular occlusion." Arterial occlusion occurs in about 60 per cent. and venous thrombosis in 40 per cent. of the cases. The condition is one which only occurs in adult life—*i. e.*, from the age of twenty to that of sixty—arterial closure occurring usually toward the latter age. The jejunum and upper ileum are most commonly involved and the changes in coils of intestine whose blood-supply has been interfered with vary as in a strangulated hernia from mere vascular stasis to gangrene. Hence the appearance of the presenting coils varies from dark red to black

[1] Surg., Gyn., and Obst., 1916, 23, 297.

[2] Ibid., 1918, 27, 66.

(Fig. 342). Clinically it is very difficult to make a diagnosis other than that of some acute abdominal condition calling for surgical interference, hence one is not surprised to find that in only 4 of the 366 cases collected by Trotter was a diagnosis made before operation. The condition is mostly diagnosed as ileus, angina sclerotica abdominis, or a severe enterocolitis. The symptoms greatly resemble those of the diseases mentioned, viz.: (*a*) pain either recurrent or continuous, of a diffuse and severe character, usually localized in the epigastric or umbilical regions, (*b*) more or less diffuse tenderness, (*c*) abdominal distention, and (*d*) diarrhea. The stools are thin, offensive, and often bloody. In some cases the diarrhea is absent, and the vomiting, abdominal distention, and inability to secure a bowel movement or the passage of flatus lead to a diagnosis of ileus.

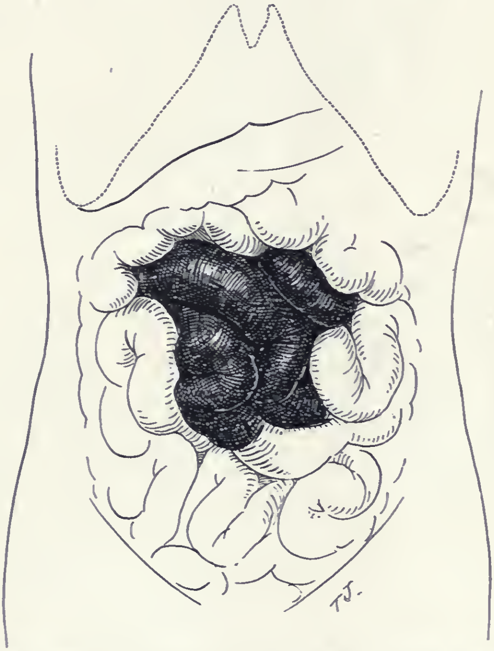

Fig. 342.—Mesenteric vascular occlusion. Note reddish-black discoloration of a number of coils of jejunum and ileum in a case of embolism of the superior mesenteric artery.

The generalized symptoms of the intestinal toxemia (subnormal temperature, rapid, soft pulse, cyanosis, etc.) appear quite early, and the entire course of the disease is a most rapid one toward a fatal outcome in the majority of cases. The only hope of surgical relief is in an early diagnosis, hence we must always keep this condition in mind in every case presenting the severe acute intestinal symptoms just mentioned in patients above the age of forty, and especially if the stools contain much blood and the clinical picture develops more rapidly than in the ordinary case of intestinal obstruction.

(*d*) *Acute Infections of the Mesenteric Lymph-nodes.*—I have seen a number of cases in which the acute enlargement of these lymph-nodes gave rise to symptoms resembling those of appendicitis or even of intestinal perforation. In a case seen in consultation on account of a suspected typhoid perforation we found an acute suppuration of the lymph-nodes at the root of the mesentery, and quite recently I have operated a child with clinical symptoms of an acute abdominal crisis which we thought to be either an appendicitis or possibly an intussusception, but found only an intense acute swelling of all of the mesenteric lymph-nodes. Howell[1] reports a case of acute lymphatic leukemia with predominance of the enlargement of the thoracic and abdominal lymph-nodes with very little enlargement of the superficial nodes. The clinical picture resembled that of appendicitis.

Acute Affections of the Small Intestine.—The acute conditions which I will place under this heading are: (*a*) Inflammatory changes in Meckel's diverticulum, (*b*) intestinal obstruction (ileus) of various kinds, (*c*) enterocolitis, (*d*) lead-colic, and (*e*) reflex ileus. To include all forms of intestinal obstruction would at first glance seem rather arbitrary, but since the clinical picture of an acute obstruction of the large intestine so greatly resembles that of the same condition in the small intestine it would seem to be justifiable for diagnostic purposes to include all forms of intestinal obstruction. I simply mention enterocolitis and lead-colic for the sake of thoroughness, since both conditions must be borne in mind in the diagnosis of an acute abdominal condition. Detailed consideration of these will be omitted here owing to the fact that they should be so well known to everyone as to render a description of their principal features superfluous. By "reflex ileus" is meant a paralytic condition of the small intestine which at times accompanies the passage of a ureteral calculus, operations upon or injuries to the kidney, and this condition will be referred to later in the section upon the kidney.

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[1] Practitioner, December, 1917.

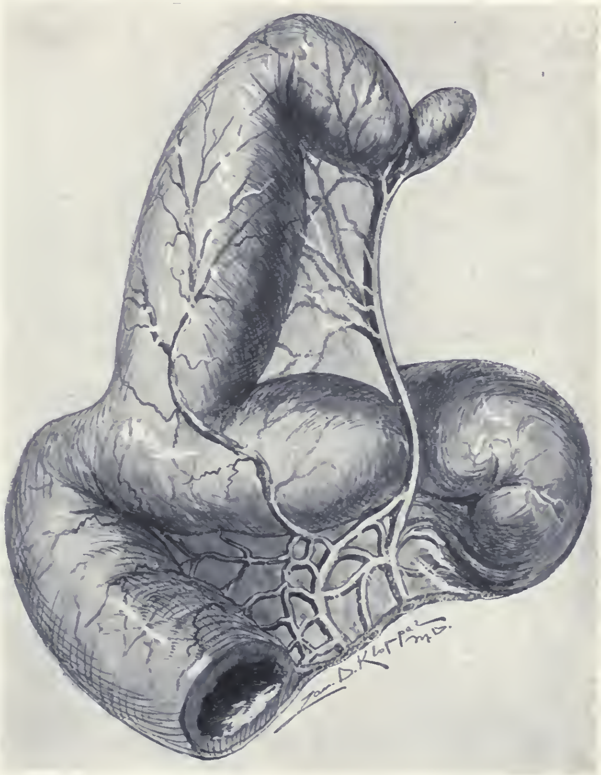

Fig. 343.—Meckel's diverticulum with large mesenteriolum. The umbilica (omphalomesenteric) vessels run along the free edge of the mesenteriolum and empty into the mesenteric artery and vein respectively (Bostrom).

(*a*) *Acute Meckel's Diverticulitis.*—Up to a recent period when the term "diverticulitis" was used, one usually understood that the reference was to an inflammation of the diverticulum or projection arising from the lower ileum, which was first described by Meckel. At the present time, however, it is necessary to specify Meckel's diverticulitis when we refer to this structure to distinguish it from pathologic changes with resultant clinical pictures taking place in the diverticula of the large intestine, to which attention will be directed in the next section.

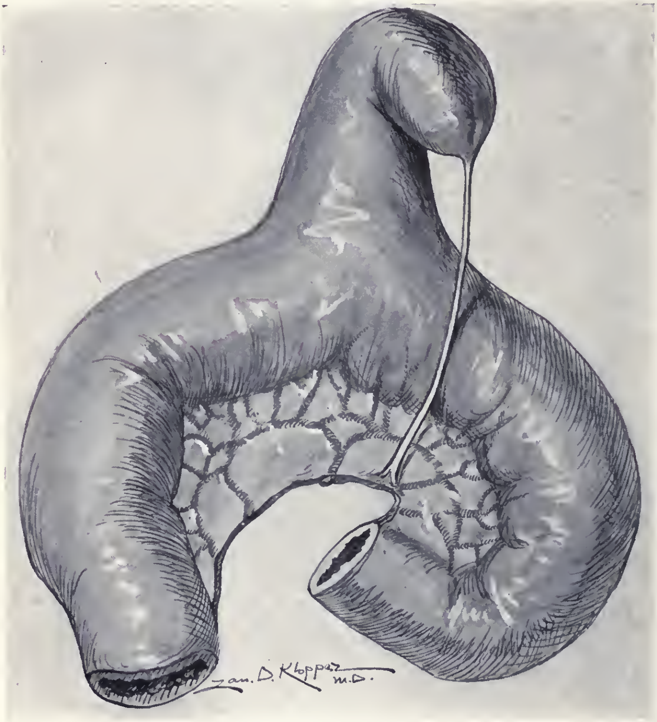

Fig. 344.—A frequent form of Meckel's diverticulum with fibrous cord (termina ligament) which usually contains the omphalomesenteric vessels (Wilms).

In the human embryo there is a direct connection between the umbilicus and the lower ileum through the medium of a finger-like projection of the gut (Fig. 343) which is called Meckel's diverticulum, and has its own mesentery. From the surgical standpoint this remnant of an embryonic structure interests us (*a*) because the diverticulum is subject to the same changes as the result of infection of its walls as the vermiform appendix, namely, acute inflammation up to the stage of gangrene (Fig. 345), with or without perforation and resulting localized or general peritonitis; (*b*) because various forms of intestinal obstruction can result if the terminal ligament (representing the atrophic distal portion) is attached to the umbilicus or to the mesentery of the gut from which the diverticulum[1] arises (Fig. 346). I will refer to this cause of intestinal obstruction later, and desire at this time to call your attention to the clinical picture due to inflammatory changes alone.

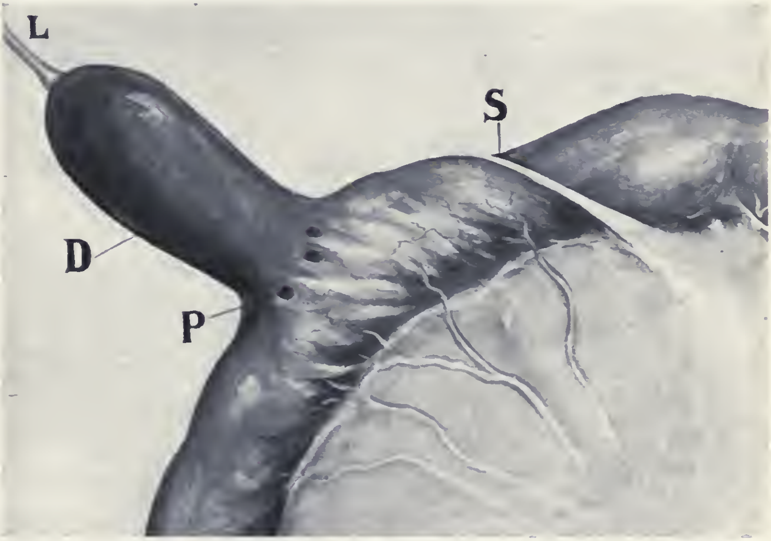

Fig. 345.—Gangrenous Meckel's diverticulum (author's case): *D*, Three perforations at its base; *L*, terminal ligament by which the diverticulum was attached to the mesentery of the same coil of intestine; *S*, a band, the remnant of the terminal ligament, which caused strangulation of the gut proximal to inflamed diverticulum. The origin of such a band can be readily understood by referring to Figs. 346 and 347.

In some of the cases there is a previous history of pain located nearer to the umbilicus than is the case in recurrent appendicitis. In the majority of cases there is no history of such an attack, the onset being sudden and the symptoms indistinguishable from those in acute fulminant appendicitis. Occasionally, as in my own case (see Fig. 356), the pain, tenderness, and rigidity are nearer to the umbilicus. My chief reason in bringing this condition to your notice is to look for it in case the visible changes in the acute appendix, as seen at operation, do not correspond to the severity of the clinical picture.

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[1] See author's article on Ileus Due to Meckel's Diverticulum, Ann. Surg., 1909, 50, 1278.

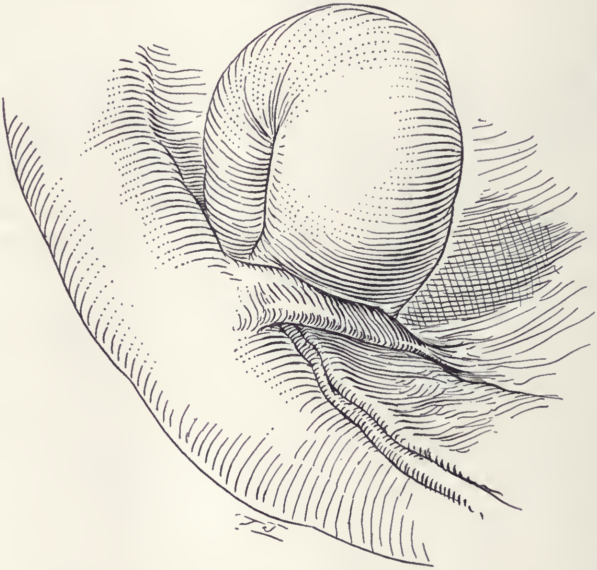

Fig. 346.—Ileus. Strangulation of small intestine beneath a Meckel's diverticulum whose terminal ligament has become attached to the mesentery from which the diverticulum arises (author's case).

(*b*) *Intestinal Obstruction* (*Ileus*).—It is impossible in a general lecture like this one to discuss in detail the various forms of ileus. Ileus is usually divided into two principal forms: (*a*) dynamic, (*b*) mechanical.

(*a*) Dynamic or paralytic ileus is the result of a paresis, or in some cases of a complete paralysis, of the contractile power of the gut wall. It occurs in peritonitis as the result of the toxins acting upon the musculature of the intestinal wall, and here is called septic ileus. Again, it is found as a postoperative condition when no sepsis is present, but is then due to trauma to the gut wall through prolonged exposure, rough manipulation, etc. This is the true form of paralytic ileus, due, no doubt, to some temporary insult to the nerve supply of the gut. A third form is seen when much blood or bile or urine is present in the peritoneal cavity. We also see a form of reflex paralytic ileus after operations upon or injuries to the kidney or ureter, after the passage of ureteral calculi, torsion of an ovarian cyst, or pedunculated uterine fibroid. Finally, a true paralytic ileus occurs after injuries of the dorsal portion of the spinal cord.

(*b*) Mechanical ileus can be divided into two classes—obturation and strangulation. A glance at Fig. 347, 1–6 will serve to recall the principal subdivisions of these two classes. I will simply enumerate them here. Obturation ileus: (*a*) congenital strictures, (*b*) obstruction of lumen by fecal matter, enteroliths, gall-stones, and other foreign bodies, (*c*) obstruction of lumen by tumors (Fig. 347, 3) from without or of gut wall itself, (*d*) obstruction by adhesions (Fig. 347, 6) or bands (Fig. 347, 5), (*e*) obstruction by strictures (Fig. 347, 4).

Strangulation ileus: (*a*) through apertures (Fig. 347, 2), (*b*) internal herniæ, (*c*) by and of Meckel's diverticulum, (*d*) volvulus, (*e*) intussusception.

The three symptoms common to all forms of ileus are (*a*) inability to pass flatus or feces; (*b*) vomiting at first mucus, then bile, later a brownish, sour, fetid material wrongly called fecal; (*c*) gradually increasing abdominal distention. The exception is intussusception; here the vomiting and abdominal distention are not at all prominent features, and in some cases there are fifteen to twenty stools a day, usually consisting of blood and mucus. Since this form of obstruction occurs chiefly in children one must keep such a possibility in mind whenever abdominal pain accompanied by symptoms of shock or collapse appear suddenly in a child. Rectal and abdominal examination for a possible tumor must be made at intervals of a few hours. Inability to secure a satisfactory bowel movement and the passage

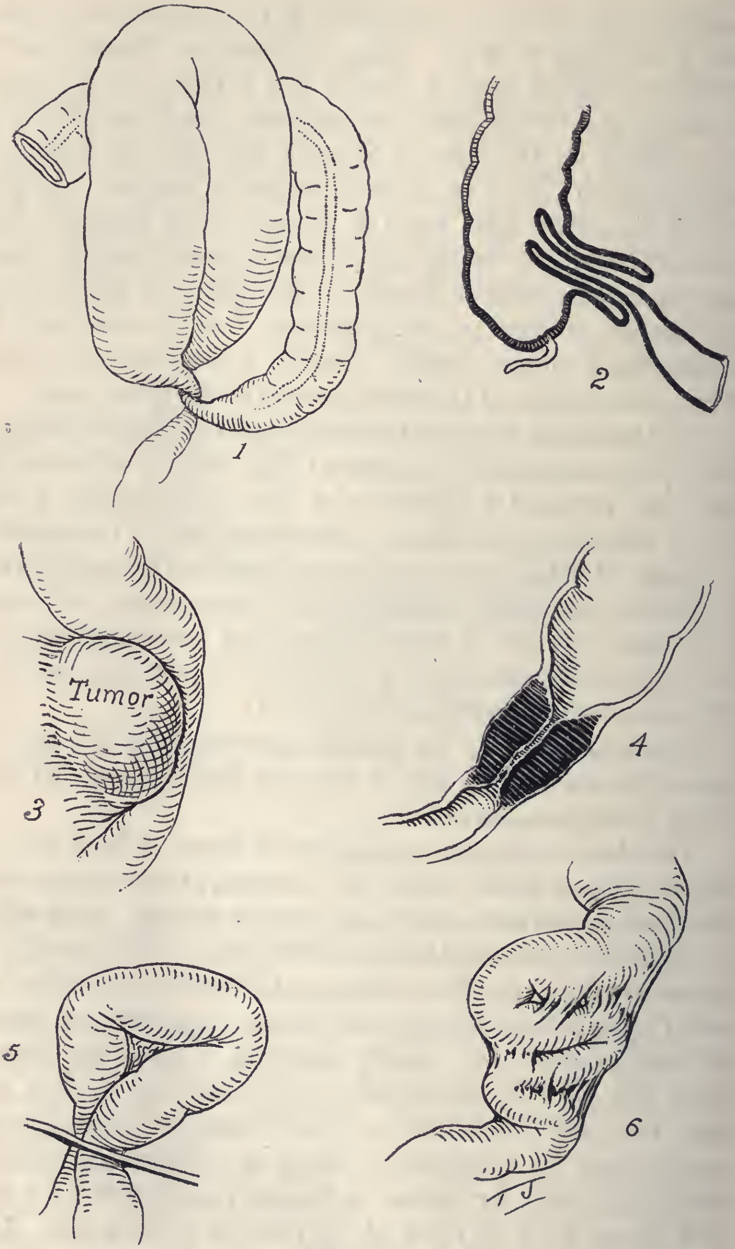

Fig. 347.

of flatus in suspected cases (even if the abdomen is not distended and there is a history of passage of frequent small stools) should lead to a search for this form.

In the other varieties of ileus you must always suspect the existence of an obstruction to the fecal current or to the circulation of the gut wall when the three cardinal symptoms, vomiting, obstipation, and abdominal distention, steadily increase in severity if one can exclude the influence of morphin. Search for a possible cause includes the history of a previous operation, existence of an external hernia, history of gall-stone attacks, etc. It is impossible to differentiate an intestinal obstruction from a case of advanced peritonitis because the symptoms are identical, the rigidity usually present in an early peritonitis having disappeared, so that the abdomen is now as soft as it would be in an obstruction case. In the early hours, however, there is much more rigidity in a case of spreading peritoneal infection, and abdominal distention and vomiting are far less marked features than in a case of ileus of similar duration.

Large Intestine (Except Cecum and Appendix).—The acute affections of this structure include: (*a*) sigmoid diverticulitis, (*b*) volvulus and other forms of ileus, (*c*) inflamed rectal diverticulum, (*d*) enterocolitis. Since inflammation of the diverticula of the rectum cannot be distinguished clinically from those of the sigmoid, these conditions will be considered together. The symptoms of the various forms of ileus of the large intestine are indistinguishable from those of the small intestine, hence the description given in the previous section applies to the large intestine as well. Enterocolitis requires no special mention, as its symptoms are so well known. Let us now consider the principal conditions of the large intestine which can give rise to acute abdominal symptoms, viz.:

Sigmoid Diverticulitis.—This is a condition in which multiple

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Fig. 347.—Ileus. Diagrammatic representation of six different forms: 1, Volvulus of the sigmoid; 2, ileocolic intussusception; 3, stricture of intestine due to extrinsic cause (tumor); 4, stricture of intestine due to intrinsic cause (syphilis, carcinoma, tuberculosis); 5, strangulation by a band; 6, obstruction due to adhesions with resulting kinking of adjacent coils.

diverticula or pouches form usually in two rows (Fig. 348) on the convexity of the gut. They are hernial protrusions of all of the coats of the gut (true diverticula) or more frequently only of the mucosa and serous layers. The orifices of communication with the lumen of the gut are quite small, and this favors accumulation of fecal material, etc., in the pouches. The pathologic changes subsequent to such retention are quite similar to those in an inflamed appendix, viz., acute inflammation up to gangrene, perforation into the free peritoneal cavity, and abscess formation. A striking difference, however, is the greater tendency to prolifera-

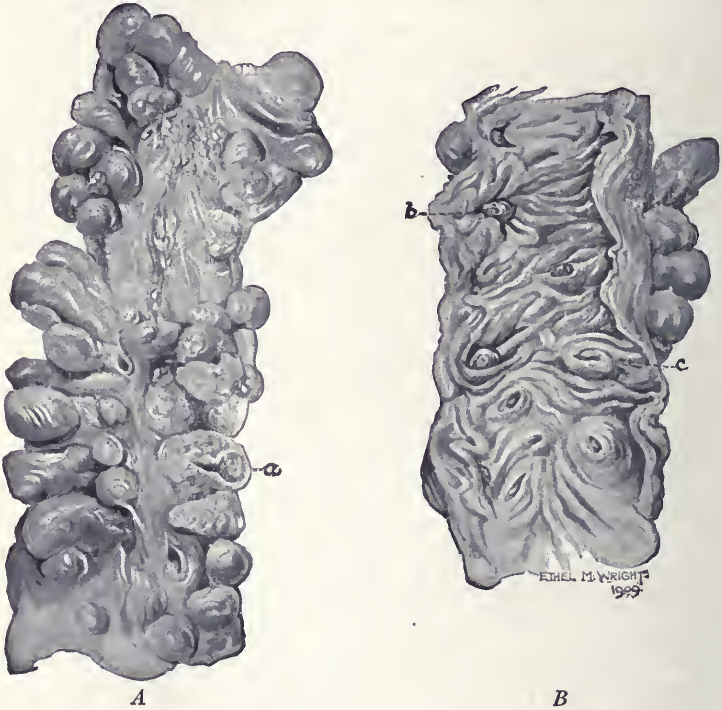

Fig. 348.—Diverticula of sigmoid: *A*, The fat has been dissected from the outer aspect of the bowel. The pouches open, for the most part, into the appendices epiploicæ. One of the sacs is laid open at *a*. *B*, Inner surface of the bowel from the same specimen. A concretion is seen at *b* presenting at the orifice of one of the diverticula. At *c* the lipped orifice is well seen. (From drawing kindly loaned by W. H. Maxwell Telling, of Leeds, England.)

tive changes around the diverticulum which results in marked thickening of the gut wall, so that in recurrent cases there is much resemblance to a neoplasm. In fact, in 31 of 42 cases recently reported by W. J. Mayo[1] malignant disease coexisted. Such a peridiverticulitis leads to thickening and stenosis of the bowel, and is often the cause of the recurrent acute symptoms. Recently[2] it has been possible to make a diagnosis of the existence of a diverticulitis by x-ray examination (Figs. 349 and 350).

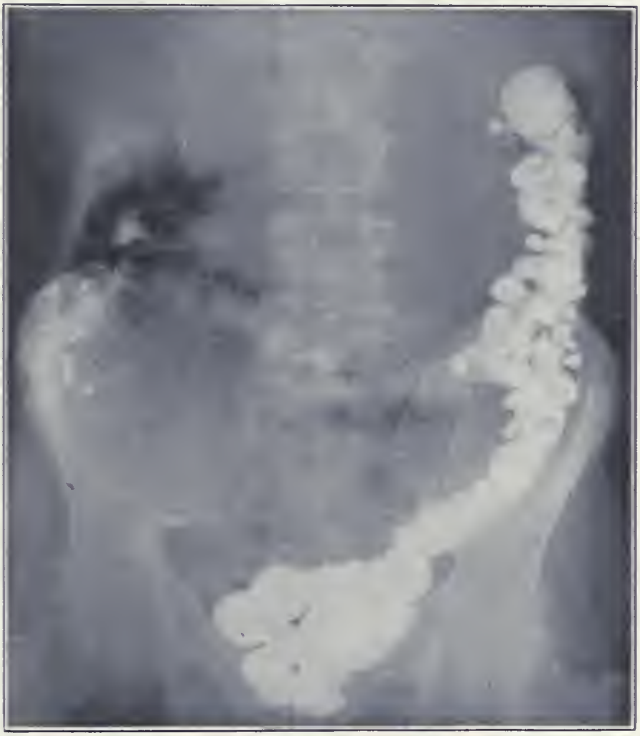

Fig. 349.—Symptomless diverticula of the sigmoid. (Collected papers of the Mayo Clinic, 1917.)

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[1] Jour. Amer. Med. Assoc., 1917, 69, 781.

[2] The most important recent contributions to this subject are those of W. J. Mayo (Jour. Amer. Med. Assoc., 1917, 69, 781), H. W. M. Telling (Brit. Jour. Surg., 1916, 4, 468), and Carman and Miller (Monograph on x-Ray Diagnosis of Alimentary Tract, 1917).

Although diverticula are found anywhere in the alimentary canal from the esophagus to the anus, we are chiefly interested in the present lecture with those of the large gut. They occur here in the cecum and may even be confined to this region; less frequently are they encountered in the ascending and transverse colon. They are again less numerous in the descending colon until the sigmoid is reached, and here they are most numerous. In the rectum they rarely occur.

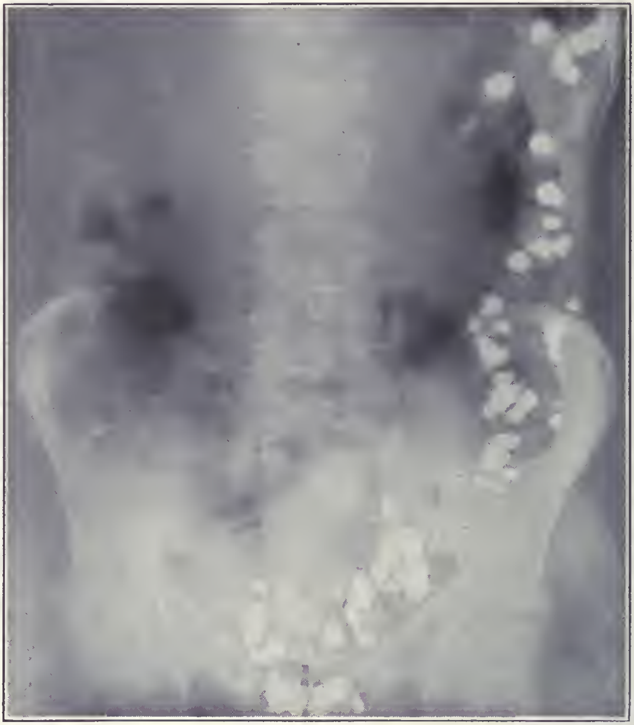

Fig. 350.—Symptomless diverticula of the sigmoid. (Collected papers of the Mayo Clinic, 1917.)

Clinically we are chiefly interested in this lecture in the acute inflammatory group which, according to Telling, constitutes the largest number of cases. The principal symptoms are: (*a*) Pain, referred in most cases to the left iliac fossa. There may be only a single attack, as in the acute or gangrenous, but more frequently there is a history of recurrent attacks. The pain is seldom accompanied by vomiting.

(*b*) Tenderness and rigidity. These are extremely frequent and confined to the left lower quadrant.

(*c*) Tumor. This has been noted in 30 per cent. of the cases, according to Telling, lying just above and parallel to Poupart's (left) ligament in a sausage-like manner. It may appear and disappear, and such a "recurrent tumor" is an especially diagnostic feature.

(*d*) Abscess formation. This occurred in 28.8 per cent. of the cases collected by Telling, and must be suspected if there is fever and leukocytosis. At times rectal examination may reveal a bulging, and perirectal abscesses, having a sigmoid diverticulitis as their source, may originate from this condition. We must always think of a possible diverticulitis and peridiverticulitis as the cause of acute left-sided abdominal symptoms in obese middle-aged patients. In the Mayo series of 42 cases only one or two diverticula were, as a rule, responsible for the condition. The history of recurrent pain in the left lower quadrant with or without symptoms of obstruction is especially characteristic of these cases.

Cecum and Appendix.—Under this heading I have included not only appendicitis, but primary non-malignant inflammation of the cecum, carcinoma of the appendix or cecum with acute symptoms, and also acute infection of the ileocecal lymph-nodes. In regard to the first named condition to which the old term "typhlitis" still clings, I simply mention it because one finds cases from time to time where the clinical picture has been that of an acute appendicitis, but the appendix itself shows relatively few macroscopic changes, while, on the other hand, the cecum shows all the evidences of an intense inflammatory reaction. These cases are extremely rare and cannot, of course, be differentiated before operation from the ordinary acute appendicitis. My reason for including carcinoma of the appendix or cecum in a lecture on acute abdominal affections is that both conditions, probably as a result of a secondary infection with pyogenic organisms, at times masquerade under the clinical picture of acute appendicitis, and one is quite surprised at operation to find malignancy present. On two occasions during the last few years I have operated upon cases which apparently had the classical symptoms of acute appendicitis, and was quite surprised when the pathologist reported the presence of a carcinoma of the appendix. Quite recently I saw a case of a similar nature in consultation with a prominent internist. An old gentleman of eighty-four presented a mass in the right iliac region which seemed fixed, but was very tender and was accompanied by high temperature and white blood count. Operation revealed the presence of an appendiceal abscess secondary to a gangrenous appendix, the latter showing at its base a carcinoma which extended up into the wall of the cecum. We know, of course, that the majority of these carcinomata of the appendix are relatively benign, are generally circumscribed, and metastasis is rare, but it is well enough to be ready for such surprises in cases presenting acute symptoms.

In regard to acute infections of the ileocecal lymph-nodes I only wish to say that the group which is due to the ordinary pyogenic organisms presents symptoms which are indistinguishable from those of an acute appendix, and it is only at operation that one notes the enormous enlargement of the ileocecal lymph-nodes which seems out of all proportion to the visible inflammatory changes in the appendix. There are, however, cases of acute tuberculous enlargement of the ileocecal lymph-nodes whose existence was not deemed possible until Gerard-Marchant[1] reported such a case in 1900, and similar cases were published by a number of French writers, and also by myself in 1909.[2] In these cases the tuberculous nature of the inflammation is hardly suspected from the macroscopic appearance of the appendix, but the enormous enlargement of the ileocecal lymph-nodes and the acute caseous changes in the same enable one to make a diagnosis of an acute tuberculous invasion. Both the pyogenic and tuberculous acute enlargements of the ileocecal lymph-nodes masquerade under the clinical picture of an acute appendix, and a diagno-

[1] Bull. et. mem. Soc. de chir. de Par., January 24, 1900.

[2] Jour. Amer. Med. Assoc., 1909, 52, 291.

sis is seldom made before operation unless the glands are palpable, as is at times the case in children, through the abdominal wall.

Appendicitis.—It is impossible in a clinical lecture in which we must consider all the acute abdominal conditions to discuss in detail a disease whose principal features are familiar to all of you. The order of appearance of the symptoms in a typical case is as follows:

(*a*) *Pain.*—This is colicky in character, often quite diffuse or localized around the umbilicus, but within a few hours localized in the right iliac region.

(*b*) *Nausea and Vomiting.*—This is reflex in the early stages, and if it persists one must always suspect the development of a peritonitis.

(*c*) *Local Signs.*—Careful palpation of the entire abdomen will show a little marked rigidity and tenderness located in the right lower quadrant, the maximum intensity of which is confined to a point midway between the umbilicus and the anterior superior spine of the ilium. If one watches a case and re-examines it at intervals of a few hours and notes that the rigidity and tenderness have spread beyond the right iliac region toward the median line and toward the left of it as well as in an upward direction, the development of a peritonitis must always be suspected.

(*d*) *Temperature.*—Always present, and I can warmly recommend taking the same per rectum, as I have found at times in these acute abdominal cases a difference of two or three degrees between the rectal and mouth temperatures.

(*e*) *Pulse.*—The pulse varies in intensity in proportion to the severity of the infection and its spread beyond the walls of the appendix. Although it shows but little change in the early stages, a rapid rise is characteristic of an incipient peritonitis.

(*f*) *Blood Count.*—With the exception of cases of an extremely fulminant character an increase in the number of white cells and a rise in the polynuclear count is always present. Hewitt, in a recent article[1] after a careful investigation of a large number of cases, finds that the high white blood count when associated with a rise in the percentage of polynuclears is of great value. In fulminating or moribund cases or where there is a walled-off abscess leukocytosis is frequently absent.

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[1] Ann. Surg., 1917, 56, 150.

(*g*) *Tumor.*—In the early stages, first thirty-six to forty-eight hours, when the rigidity and tenderness are quite marked, it is impossible to palpate a tumor mass. It is only at a later period when an encapsulated abscess is present or the appendix is surrounded by adhesive omentum that one can palpate a tumor. Hence, it is seldom necessary to resort to this method of diagnosis, *i. e.*, palpation of a tumor.

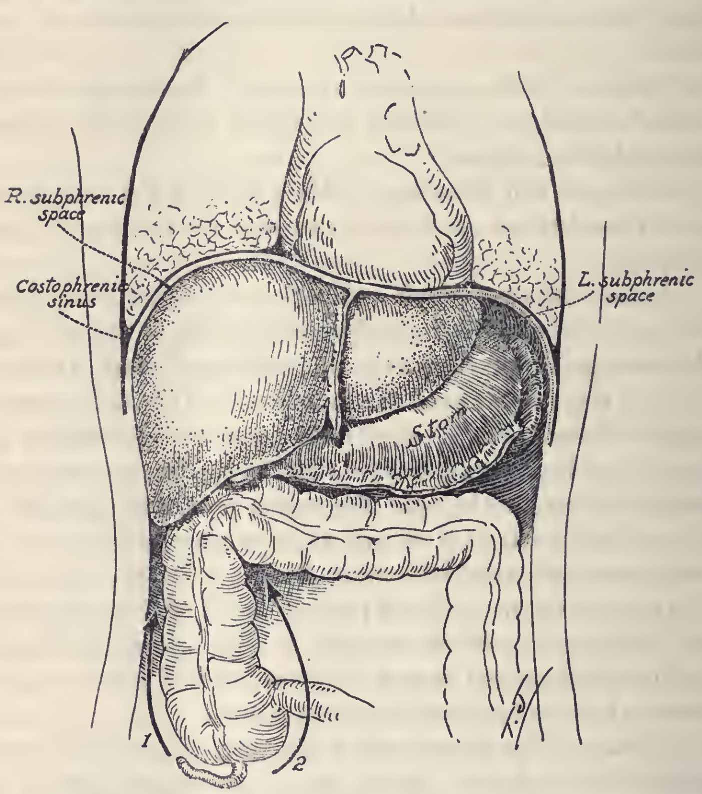

Fig. 351.—Retrocecal appendix. Topographic relations of the organs of upper abdomen to those of thorax. Arrows indicate how infection travels along outer or inner edge of ascending colon from appendix to subphrenic space. (Surgical Clinics of Chicago, October, 1917.)

Having given you briefly some of the more prominent symptoms of appendicitis in a normally located appendix, let me call your attention to the difficulty of diagnosis when the appendix is attached to a non-rotated cecum (Fig. 352), and also of the acute inflammatory symptoms which persist in the right upper quadrant instead of the right lower quadrant. Again, let me recall those cases where the appendix points upward and outward along the outer or posterior surface of the ascending colon—*i. e.*, the retrocecal appendix (Fig. 351). Here the inflammatory symptoms are often most marked in the right ileocostal space instead of the right iliac region, and simulate very closely a perinephritic inflammation or an intrarenal infection. Again we must remember the possibility of the appendix being attached to a cecum which is so movable that it is either drawn over to the median line (Fig. 354) or even as far as the left iliac

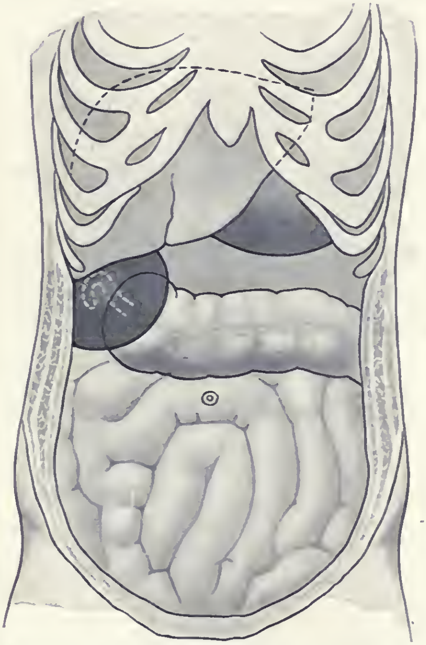

Fig. 352.—Location of a subhepatic appendiceal abscess due to non-rotation of cecum. Appendix pointing upward toward liver. (Eisendrath's "Surgical Diagnosis.")

fossa. In children and not so rarely in adults the appendix points downward and inward toward the floor of the pelvis, and in females inflammation of such a pelvic appendix simulates a salpingitis. I have already directed attention to the possibility of the combination of a pelvic appendiceal abscess in such cases (Fig. 354) and of intestinal obstruction. And not infrequently after the removal of the appendix and the draining of the accompanying abscess the symptoms of ileus persist as the result of the agglutination and the kinking of the coils of the terminal ileum surrounding the appendix. This pelvic position of the appendix is of especial importance in children, as tenderness is often absent at McBurney's point and only present over the pelvis. Hence rectal examination should never be omitted in children.

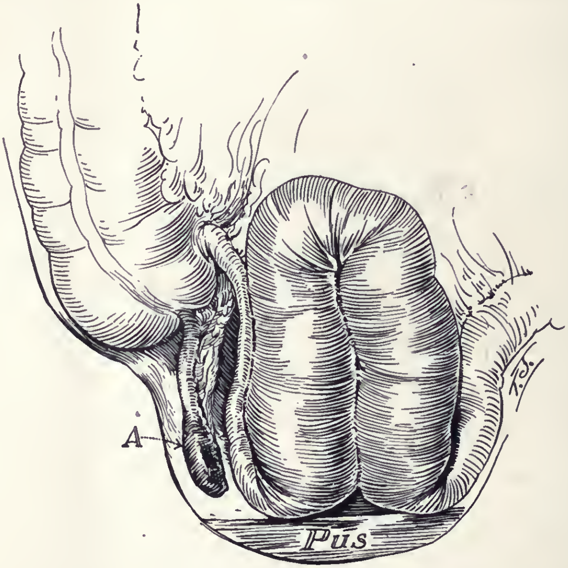

Fig. 353.—A form of intestinal obstruction which may complicate acute appendicitis when appendix (*A*) lies in true pelvis and coils of terminal ileum become agglutinated and lie in pus. In these cases the abdominal distention, vomiting, and inability to pass feces or flatus is not relieved by the removal of the appendix and drainage of the abscess. (Surgical Clinics of Chicago, October, 1917.)

Another feature of appendicitis to which I wish to direct attention is the possibility of the occurrence of hematuria when the appendix lies in close relation to the ureter. The hemorrhage occurs either from extension of the inflammation from the appendix to the ureter or from adhesions. The French writers have given this form of hematuria a special name—*appendicite hematurique.*

In a previous lecture I have directed attention to the most important complications of appendicitis, and only wish to refer here briefly to peritonitis. You must always suspect the development of such a complication when the tenderness and muscular rigidity gradually extend over the entire abdomen and are accompanied by a noticeable increase in the degree of abdominal distention and vomiting. When these local symptoms—diffuse rigidity and a tenderness and gradually increasing abdominal distention—are

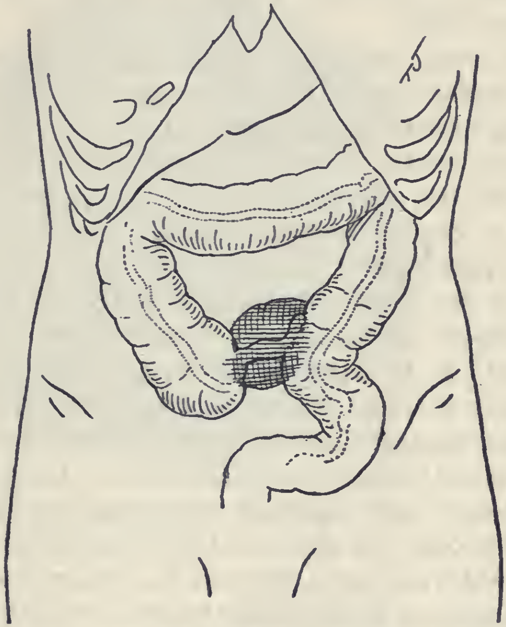

Fig. 354.—Location of appendiceal abscess in case described in clinical lecture. The cecum has been drawn over to the median line and the appendix was adherent to the mesosigmoid, the sigmoid also being drawn over to the median line. The walls of the abscess cavity (indicated by shaded area) were thus formed by the appendix, mesosigmoid, sigmoid, and adjacent coils of ileum.

accompanied by an inability to secure the passage of flatus or feces and persistent vomiting with a rapid increase in the pulse rate, you must be prepared to find that the infection is spreading to all portions of the peritoneal cavity. In very septic cases the pulse is extremely rapid and the temperature and white blood count low, and even rigidity may be absent. Search for evidences of free fluid or for absence of liver dulness is a waste of valuable time, as these symptoms are so uncertain as to be of practically no diagnostic value.

Before leaving the subject of appendicitis let me mention briefly typhoidal inflammation of the appendix. In many cases the predominance of the symptoms of typhoidal infection of the appendix obscures the underlying disease, and it is only when the surgeon finds that the temperature is out of proportion in its height to the local symptoms and the leukocytosis is low that a typhoidal appendicitis is suspected. In the majority of cases that I have seen it was only the persistently high temperature after the removal of the appendix that led to the suspicion of a typhoid and a hasty search for the Widal reaction.

Peritonitis is always secondary to some infective focus, (*a*) either in an extra-abdominal structure, or (*b*) to an inflammatory process in one of the intra-abdominal viscera. In the first group we include as its most important member the peritonitis due to the pneumococcus. In the second group are included cases of peritonitis which develop as the result of a primary infection, *e. g.*, in the alimentary or genito-urinary tracts, or rarely by extension from the thoracic cavity. Peritonitis secondary to extension from an inflamed viscus has been described in connection with its occurrence in appendicitis, and any further reference seems superfluous.

Pneumococcus Peritonitis.—This may occur either as a local manifestation of a generalized infection of the lungs, pleura, joints, endo- and pericardium, etc., or, more frequently, as the chief point of localization of the pneumococcus, *i. e.*, the only focus which gives rise to clinical symptoms. I recall a very important case belonging to the former group which occurred in this hospital during the past winter. We removed an appendix which showed acute inflammatory changes, and were greatly surprised, when four days after operation, there were unmistakable symptoms of a generalized peritonitis as well as of a pneumonia. The patient died about one week after operation and the autopsy revealed no cause for the peritonitis at the seat of operation. The lungs showed a typical diffuse bronchopneumonia, the left pleural cavity, pericardium, and entire peritoneum showed a wide-spread pneumococcus infection. The peritonitis in this case was only a portion of a most severe generalized infection. The cases in which the pneumococcus peritonitis symptoms predominated in the clinical picture were not recognized as a distinct clinical entity[1] until a short time ago, but it is important to bear this acute

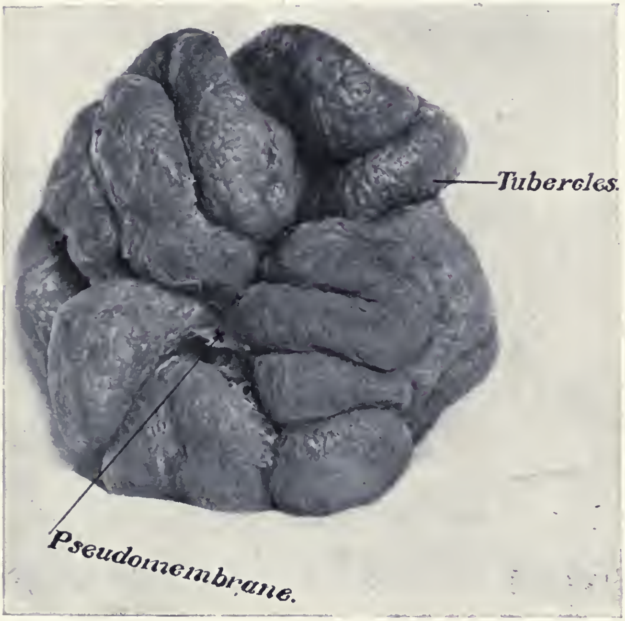

Fig. 355.—Coils of intestine in a case of tuberculous peritonitis. The labe "pseudomembrane" leading to a cross shows how these false membranes bind the different coils of intestine to each other. The serous surfaces of the various coils show innumerable tubercles covered by this false membrane. (Eisendrath's "Surgical Diagnosis.")

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[1] A very valuable contribution to the subject will be found in the article of Parker Syms, Annals of Surgery, 1918, 67, 263, from which I have quoted freely.

condition in mind when we examine a child with severe peritoneal symptoms. The disease affects especially children, and girls oftener than boys. It may occur as (*a*) an exclusively local condition, (*b*) as a sequel of a similar infection elsewhere (lungs, pleura, ear, etc.), or (*c*) as a part of general peritoneal sepsis. There are two forms—(*a*) the diffuse and (*b*) the encapsulated. The onset is always sudden, with evidences of extreme toxemia, such as vomiting, diarrhea, cyanosis, very high fever, and white blood count. One should always be suspicious of a peritonitis accompanied by diarrhea. There is a notable absence of local symptoms, such as rigidity and tenderness, as compared to the peritonitis complicating an appendicitis. The encapsulated form (Fig. 355) is far easier to recognize than the diffuse form, and is amenable to operation, which is contraindicated in the diffuse form.

There are two other forms of peritonitis which give rise to acute clinical pictures, viz., gonorrheal and tuberculous (Fig. 356). The former is very rare as a diffuse process, and must be thought of when the usual signs of a generalized peritonitis accompany or supervene upon an acute pelvic infection in the female. In regard to tuberculous peritonitis, the view held by many surgeons that this condition invariably begins in a slow, insidious manner must be changed. There are a rapidly increasing number of cases in which the signs of a tuberculous peritonitis either appear in an acute manner following an attack of appendicitis or salpingitis, or in a subacute one with continued high fever, great prostration and abdominal distention greatly resembling a typhoid in its course, but being, in reality, a severe tuberculous peritonitis with early caseation of the mesenteric lymph-nodes. I have already referred to the acute mode of onset in some cases of a tuberculous appendicitis with extensive invasion of the ileocecal lymph-nodes, and the same is true of a primary tuberculous tubal infection. We must constantly bear these possibilities in mind in cases in which there are evidences of free or encapsulated exudate (Fig. 356) and the history of a sudden onset with pain, fever, and the local signs of an acute abdominal crisis, such as localized rigidity and tenderness.

I cannot leave the subject of peritonitis without referring briefly to two features which are of more than passing interest. There can no longer be any question that peritonitis arising from an appendicitis or from a diverticulitis may at times be found without a visible perforation of the structure from which the peritonitis has unquestionably had its origin. Noetzel,[1] Hirschel,[2] Sprengel,[3] and myself[4] have reported a number of such cases of peritonitis without visible perforation of the appendix.

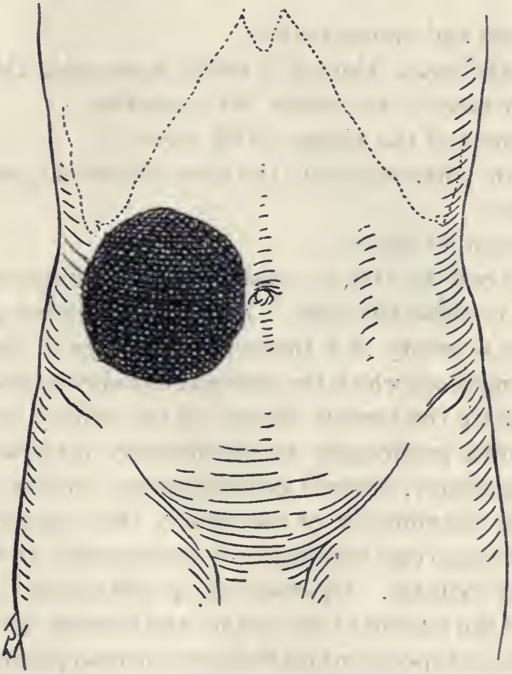

Fig. 356.—Circumscribed area of dulness (shaded area) in one of author's cases of encapsulated tuberculous peritonitis with apparently acute clinical course.

I desire also to call your attention to a similar condition which exists in relation to the gall-bladder. Buchanan[5] has recently collected 16 cases, including one of his own, in which a biliary peritonitis was found at operation without visible perforation of the gall-bladder. The bile undoubtedly passes through the gall-bladder wall by a process of filtration.

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[1] Beitr. z. klin. Chir., vol. xlvii.

[2] Ibid., vol. lvi.

[3] Deutsche Chir., volume upon Appendicitis, p. 227.

[4] Amer. Jour. of Surg., December, 1908.

[5] Surg., Gyn., and Obst., 1918, 26, 303.

Acute Affections of Genito-urinary Tract.—Among those which I have mentioned in my previous lecture are:

(*a*) Acute infections of kidney, perinephritic tissue, and ureter.

(*b*) Renal and ureteral calculi.

(*c*) Dietl's crises (kinking of ureter in movable kidney).

(*d*) Strictures of the ureter, with infection.

(*e*) Tumors of the kidney (with fever).

(*f*) Acute inflammation of the intra-abdominal portion of the vas deferens.

(*g*) Torsion of testes.

We will only be able to consider the most important clinical symptoms of these affections. Let me again direct your attention to the necessity of a thorough knowledge of the principal diagnostic methods which the urologist of today employs in order to differentiate the various diseases of the urinary tract in both sexes. I refer particularly to urethroscopy (anterior and posterior), cystoscopy, ureteral catheterization, ordinary or stereoscopic *x*-ray examination of the urinary tract combined or not (as the individual case requires) with pyelography, and finally the use of *x*-ray catheter. By observing in this manner (*a*) the appearance of the interior of the urethra and bladder, (*b*) by obtaining cultures and specimens for ordinary microscopic and chemical examination of the urine from each kidney, (*c*) by a study of the size and outline of the ureteral lumen and renal pelvis with thorium, and (*d*) by the interpretation of shadows in relation to the *x*-ray catheter we can make a diagnosis of which particular lesion of the urinary tract is present. In other words, I wish to impress you with the fact that the clinical history and our physical examination of the patient without the use of the above more accurate methods will only enable one to make a diagnosis in a relatively small proportion of cases.

Let us now discuss briefly the chief diagnostic features of the acute affections I have mentioned.

(*a*) *Acute Infections.*—The organisms or their toxins are carried to the kidney, (*a*) through the blood-current (hematogenous route—Fig. 357), (*b*) through the lymph-vessels of the ureter (lymphogenous route), or (*c*) finally, by way of the urinary stream, *i. e.*, through the ureteral lumen from the bladder.

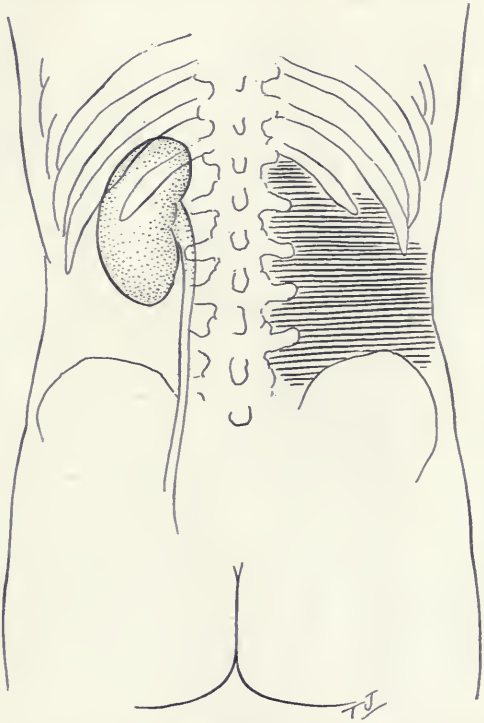

Fig. 357.—Posterior view of body showing on the left side the position of kidney and ureter as projected on surface of body. On the right side the shaded area indicates the typical location of tenderness and rigidity in the ileocostal space in acute infections of the kidney and occasionally in retrocecal appendicitis.

Either the pelvis, parenchyma, or perinephritic tissue may be involved alone, but more frequently there is an extension of the infection from one to the other. Clinically we may divide infections of the upper urinary tract into (*a*) those *with* localizing symptoms, such as pain, tenderness, rigidity, enlargement of kidney, etc.

(*b*) Those *without* localizing symptoms. In the first named group the attention of the physician is directed to the possibility of a kidney infection by the complaint of pain referred to one of the upper quadrants of the abdomen and to the iliocostal space of one or both sides (Fig. 358). On examination we usually find more or less tenderness and rigidity, and often the enlarged kidney can be palpated.

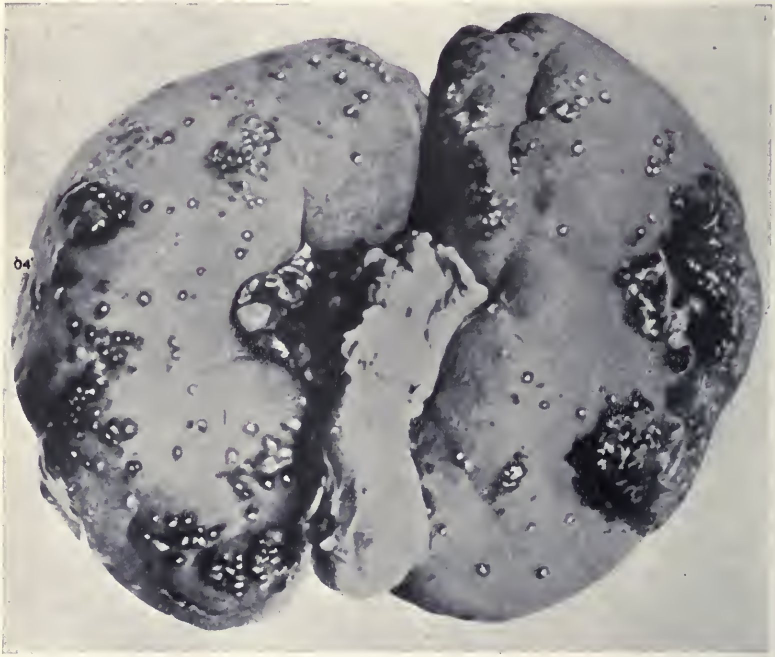

Fig. 358.—Appearance of surface of the kidney in acute hematogenous infection (pyelonephritis). Note large number of miliary abscesses, each one of which is surrounded by an intense zone of hyperemia.

Fever is an almost constant accompaniment of acute renal infections. It may be of the continuous type, and if there are no localizing signs and it is accompanied by symptoms of generalized sepsis an erroneous diagnosis of influenza, typhoid, central pneumonia, etc., is not infrequent. When the infection predominates in the renal pelvis and the parenchyma is only moder-

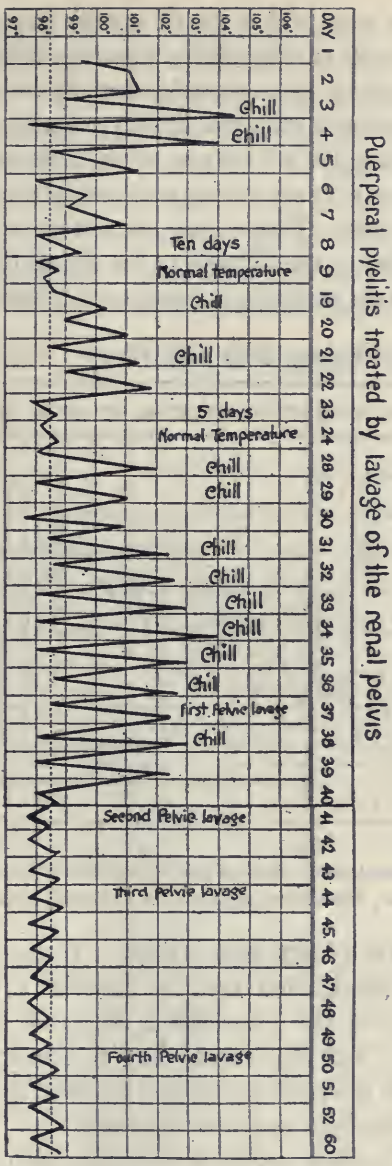

Fig. 359.—Temperature chart from a case of puerperal pyelitis illustrating how the clinical pictures of a most severe generalized sepsis may be caused by an infection of the kidney with practically no localizing signs.

ately affected, the fever is very apt to be of the intermittent type, each rise of temperature being preceded by a chill and followed by a sweat. This has given rise to the term "pseudomalarial type of pyelitis," a term which should not be employed, as it is only confusing. Such an irregularly recurring chills, high fever, and sweat combination is frequently seen in cases of acute pyelonephritic infection in children, during pregnancy, and in the puerperium. Figure 359 is from one of my cases of puerperal pyelitis which was seen in consultation with the most excellent internists and obstetricians. There were absolutely no localizing symptoms pertaining to the kidney, as the source of infection and the elimination of the genitalia as a source of infection led to the tentative diagnosis of a septic endocarditis. It was only after a careful cystoscopic examination and the ureteral catheterization with cultural study of the urine that a diagnosis was made of right-sided pyelitis, and the subsequent treatment of the infection with lavage of the renal pelvis was followed by a prompt drop in the temperature and complete recovery.

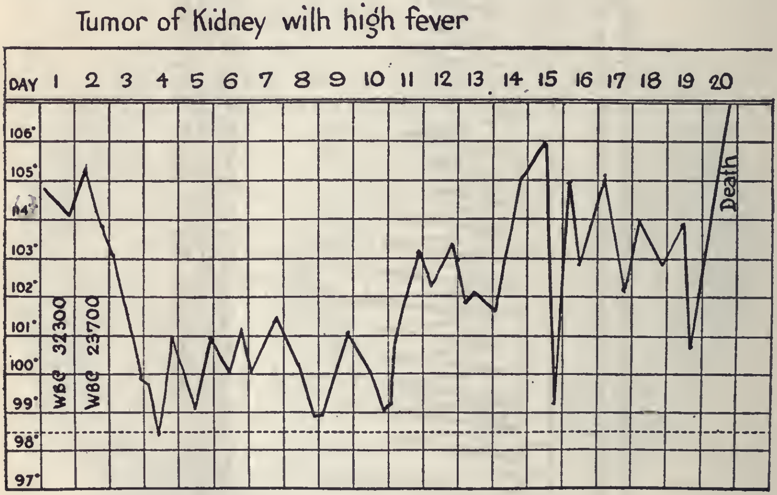

Fig. 360.—Temperature chart from case of sarcoma of the kidney in child of four, with high fever, simulating appendiceal abscess. (Case of Dr. Lawrence.)

Some of the most severe acute septic pictures in children are due to an acute infection of the kidney without any localizing signs, and it is only by a process of exclusion that a diagnosis of renal infection is made. Occasionally a malignant tumor of the kidney, as is shown in the temperature chart (Fig. 360), may cause high temperature and simulate an acute renal infection, or, as in the case whose temperature chart is shown in the illustration, may simulate retrocecal appendiceal abscess. In this connection let me call your attention to the mixed infection where pyogenic organisms like the staphylococci or the colon bacilli are added to a tuberculous infection of the kidney (Fig. 361), and the acute symptoms of a renal infection due to the pyogenic organisms completely obscures at first an underlying tuberculous infection. I have recently called attention to these cases,[1] and the surgeon must always suspect such a combination if the temperature does not drop after opening a perinephritic abscess.

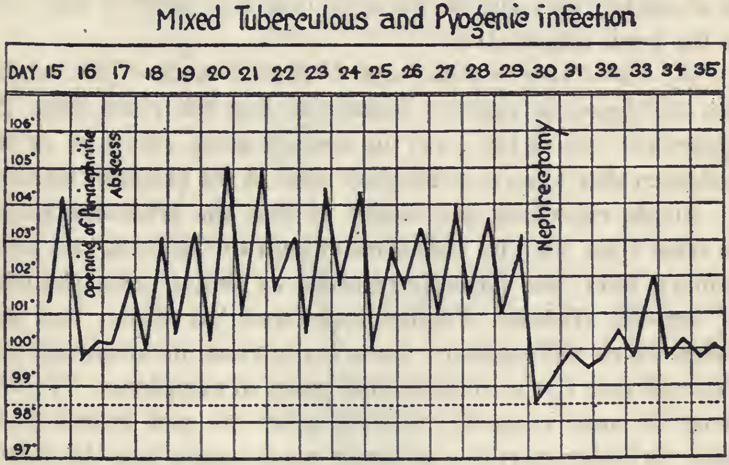

Fig. 361.—Temperature chart from case of perinephritic abscess due to mixed tuberculosis and pyogenic infection of the kidney. Temperature persisted after operation of perinephritic abscess until kidney was removed.

Ureteral colic is not at all a typical symptom of renal infection, but may be present at times as practically the only symptom of renal infection, accompanied by a slight rise of temperature. I shall refer to this again under colics due to ureteral calculi. The study of the urine alone is of little value in localizing a urinary infection. This localization must be done with the use of various diagnostic methods which I have mentioned before. At the same time let me warn you against ureteral catheterization during an acute stage if obstruction is present. It is better, if there is no urgent indication, to refrain from this procedure until a latent stage has been reached. It was formerly taught that one could differentiate an infection of the renal pelvis, at least of the upper urinary tract from the lower urinary tract, by the presence of small, long-tailed epithelial cells with relatively large nuclei, but we now know that this is of absolutely no value, as the same cells may occur in infections of the lower urinary tract.

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[1] The Diagnosis and Treatment of Tuberculosis of the Kidney, Illinois, Med. Jour., August, 1918.

(*b*) *Colics Due to Renal and Ureteral Calculi.*—This subject has developed so rapidly during the last ten years since the systematic use of the *x*-ray in obscure acute affections of the abdomen that I can only mention some of the principal features.

Ample experience has taught us that the syndrome known as renal colic, with its radiations of pain to the testis and lower urinary tract, was formerly regarded as almost pathognomonic of ureteral lithiasis. Further experience has shown that any lesion which will suddenly cause an increase in intrarenal tension will give rise to the identical group of symptoms. Typical renal or, more correctly, ureteral colics are now known to be seen: (*a*) when particles of tumor mass escape into the ureter, (*b*) when blood-clots or pus detritus are passed from the renal pelvis into the ureter, (*c*) in cases of renal or ureteral infection, (*d*) in nephritis, (*e*) in appendicitis when the ureter is in close proximity to the inflamed appendix, (*f*) in tabes, (*g*) in strictures of the ureter whether of congenital or acquired origin, (*h*) in kinking of the ureter as observed in cases of movable kidney or compression of the ureter[1] by an accessory artery to the lower pole of the kidney. Nor does the symptom of fixed pain over the kidney or along the course of the ureter fare any better. In a recent analysis of the symptoms of a large number of cases of ureteral calculi from the Mayo Clinics, Braasch and Moore[1] found that pain was referred largely to the kidney in 67 per cent., to the upper abdominal quadrant in 15 per cent., and to the region of the lower ureter or bladder in 11 per cent. (Fig. 362). No definite radiation of pain was observed in 5 per cent. and no pain whatever in 2 per cent. We thus see that the symptoms of a fixed pain in ureteral calculi independent of colicky attacks is distributed over such a wide area in the abdomen that there is no characteristic localization or radiation. The fact that ureteral calculi can be present for many years without giving rise to any symptoms at all makes it incumbent upon us to study the urinary tract in every thorough examination of the abdomen, especially when there is a history of colics, fixed or radiating pain, or of microscopic or macroscopic hematuria. It is only through the employment of some or all of the methods of diagnosis which have been developed in the special field of urologic

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[1] I have recently reported a typical example of such a cause of ureteral colics (SURGICAL CLINICS OF CHICAGO, February, 1918, p. 95).

[1] Jour. Amer. Med. Assoc., 1915, 65, 1234.

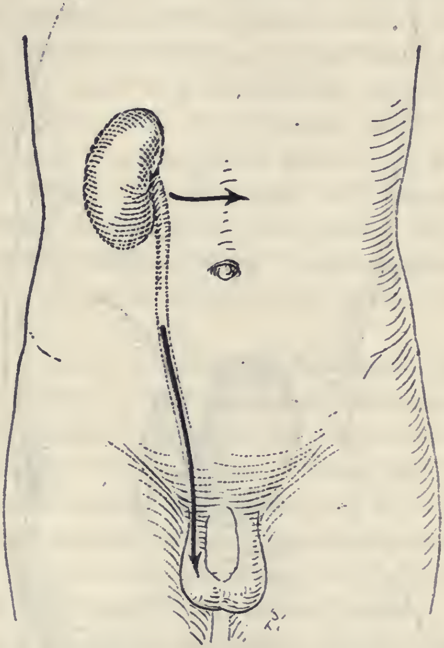

Fig. 362.—Most frequent directions in which pain due to ureteral colic radiates. Heavy arrow indicates typical radiation toward testes or bladder. Short arrow indicates less frequent radiation toward front of abdomen and toward median line.

surgery in the past ten years that we are able to differentiate the various diseases of the urinary tract which can give rise to symptoms identical with those of ureteral calculi.

It is not infrequent for ureteral or renal calculi to be the cause of a most severe clinical picture of acute sepsis without any suspicion of their presence manifesting itself by pain or history of colics.

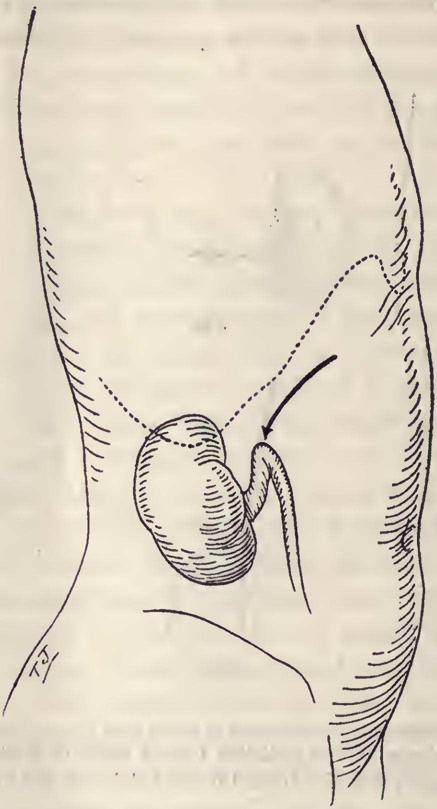

Fig. 363.—Lateral view of abdomen showing how ureter can be kinked by movable kidney causing intermittent hydronephrosis and the clinical syndrome known as Dietl's crisis.

(*c*) *Dietl's Crises.*—This is a clinical syndrome which was first described by Dietl, in which, as a result of the extreme range of motion of a movable kidney, the ureter becomes kinked, *i. e.*, bent at a sharp angle, resulting in severe pain accompanied by vomiting, etc., resembling in every particular a colicky attack due to a ureteral calculus (see previous section). A very characteristic finding is the presence of a considerable enlargement of the kidney as a result of the temporary obstruction of the ureter during the attack (Fig. 363). The presence of blood in the urine is, of course, not at all diagnostic of this condition, as it may be present in many other causes of ureteral colic. In the interval between attacks it is comparatively easy to make a diagnosis of the underlying condition by filling the lumen of the ureter and pelvis with some solution which is not penetrated by the *x*-ray so as to obtain an accurate picture of the position of the kidney in a horizontal and upright posture of the patient and of the size of the renal pelvis. This diagnostic method is known as ureterography or pyelography, and is absolutely without danger if a liquid like thorium is allowed to flow in by gravity.

(*d*) *Strictures of the Ureter with Infection.*—In a previous lecture I have directed your attention to the various causes of strictures of the ureter,[1] and will ask you to refer to this for detailed consideration of the subject. I only wish to call your attention with the present clinical case to the fact that such strictures not only give rise to repeated acute attacks of ureteral colic but also to persistent enlargement of the kidney, *i. e.*, a hydronephrosis which may or may not be infected.

(*e*) *Tumors of the Kidney with Fever.*—I have referred to this rather rare condition in connection with the subject of acute infections of the kidney, and only mention it again to ask you to bear it in mind in the differential diagnosis of obscure cases.

(*f*) *Acute Inflammation of the Intra-abdominal Portion of the Vas Deferens.*—This condition may at first glance seem rather to have been wrongly included in this subject of the acute abdomen, but I have seen a number of cases of acute gonorrheal epididymitis in which there were such marked lower abdominal symptoms in the first twenty-four to forty-eight hours that the thought arose in all of the patients that we were dealing with an acute appendicitis accompanying an acute attack of gonorrhea until the swelling of the epididymis cleared up the diagnosis.

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[1] SURGICAL CLINICS OF CHICAGO, February, 1918, p, 95.

If you will recall the manner in which the infection of the genital tract in the male spreads from the urethra to the epididymis by way of the seminal vesical and vas deferens, it will not be difficult to understand why such acute symptoms may arise from symptoms of the (intra-abdominal) extraperitoneal portion of the vas deferens.

(*g*) *Torsion of Testes.*—The torsion of the spermatic cord can, of course, only occur in cases of non-descent of the testis, but you must think of such a possibility when acute abdominal symptoms accompany a painful irreducible swelling in the inguinal region.

Internal Genitalia of the Female.—This subject is so thoroughly covered in all the standard text-books on gynecology that I need only mention some of the principal conditions of the internal genitalia which may give rise to symptoms simulating those of other acute abdominal conditions.

The torsion of the pedicle of an ovarian cyst or a pedunculated fibroid of the uterus greatly simulates in its early stages an attack of early appendicitis, and this clinical picture becomes even more confused when the paralytic ileus, which so frequently accompanies these cases, begins. One must always suspect the possibility of such a gynecologic condition when acute abdominal symptoms appear in young girls or later in life when fibroids are so frequently found. To differentiate an acute pelvic infection giving rise to salpingitis, ovaritis, etc., from an appendicitis is not difficult if the cecum is located in its normal position, because the pain, rigidity, and tenderness in acute pelvic infections in the female are located nearer the median line and above the inguinal folds, while in appendicitis they are nearer the anterior superior spine and iliac fossa. When, however, the cecum is extremely movable or the cecum itself lies in the true pelvis, as is so frequently the case, or an appendix (see Fig. 353) attached to a normally placed cecum extends across the iliac vessels into the true pelvis, it is extremely difficult to differentiate a salpingitis from an appendicitis unless vaginal and rectal examinations show that the inflammatory disturbance is limited to the right side of the pelvis.

The early stages of extra-uterine pregnancy before rupture of the tube or a tubal abortion may simulate an attack of appendicitis on account of the sharp colicky pain due to the distention of the tube; manual vaginal examination will clear up the diagnosis in the majority of cases. After rupture has occurred the symptoms of internal hemorrhage predominate and there are very few non-traumatic conditions which simulate the clinical picture of a ruptured extra-uterine pregnancy or abortion in the first twenty-four to forty-eight hours. If, however, the case is not seen until after the hemorrhage has occurred the diagnosis is not so easy. This is due to the fact that the patient has recovered to a great extent from the acute anemia. Furthermore, the presence of a considerable quantity of free blood in the peritoneal cavity will give rise to a leukocytosis simulating that of a true infection, *e. g.*, appendiceal. When a condition of moderate paralytic ileus ensues with the abdominal distention, inability to secure the passage of much flatus and the generalized tenderness in such late cases frequently simulates either an early peritonitis or intestinal obstruction.

I have directed your attention to this picture of the late stages of non-operated cases of extra-uterine pregnancy because I find that there is very little mention in the standard books on gynecology of the diagnosis of a case seen at this stage.

Extra-abdominal Causes of Acute Symptoms.—Let us enumerate again the various causes which we must think of, outside of the abdomen, which can give rise to acute symptoms: (1) referred pain from thoracic conditions; (2) nervous system; (3) hysteria.

(1) *Thoracic Conditions.*—Cases of both pneumonia and pleurisy occur in which there is complaint of severe pain in the abdomen at the onset of the disease. This is especially true in children. There may be rigidity of the abdominal muscles on the side affected. In pneumonia there is a history of a chill. The acute onset is followed by dyspnea and marked increase in

respirations and pulse-rate. The pain is seldom as well localized as in the acute abdominal conditions, nor is the muscular rigidity as circumscribed and constant.

There is one form of pleurisy (diaphragmatic) which simulates acute abdominal affections very closely. J. A. Capps[1] gives the following as the main points of differentiation between diaphragmatic pleurisy and inflammation of the abdominal viscera: The skin and muscles of the abdomen are more sensitive to pain and touch in referred pleural pain than in visceral disease. This is elicited best by pinching the wall and scratching the skin. The cutaneous reflexes are more lively in referred pain as a rule. Deep pressure with the flat surface of the fingers is well borne in referred diaphragmatic pleural pain, while it elicits a dull, deep pain when applied over an inflamed organ. Evidences of respiratory infection usually are present in diaphragmatic pleurisy. Appearance of a sharp definitely localized pain in the neck on the same side as the abdominal pain often reveals the true condition, as it points to irritation of the phrenic nerve. Referred pains in the neck and abdomen usually are induced or aggravated by cough and deep inspiration. Nausea and vomiting are more constant in visceral abdominal inflammation, but may occur and be very pronounced in diaphragmatic pleurisy. Hiccup is not a common symptom in the latter; it is seen more often in visceral disease.

Objectively but little can be found, and a differential diagnosis is difficult in the early hours. The case should be watched for several hours before a final diagnosis is made.

(2) *Nervous Symptoms.*—(*a*) *Referred Pain from Spinal Conditions.*—Spondylitis, and tumors of the spinal cord, of its membranes, or of the vertebræ, may cause severe abdominal pain, which is referred to the terminal filaments of the spinal nerves of the corresponding segment in the abdominal wall (Fig. 364). The pain is seldom as acute as in true abdominal affections, and is not accompanied by muscular rigidity or tenderness. Examination of the spine for evidences of spondylitis will soon exclude this cause. Examination of the nervous system and the history of the

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[1] Amer. Jour. Med. Sci., 1916, 151, 333.

case will eliminate tumors of the cord or spinal column, either of primary or secondary (metastatic) origin.

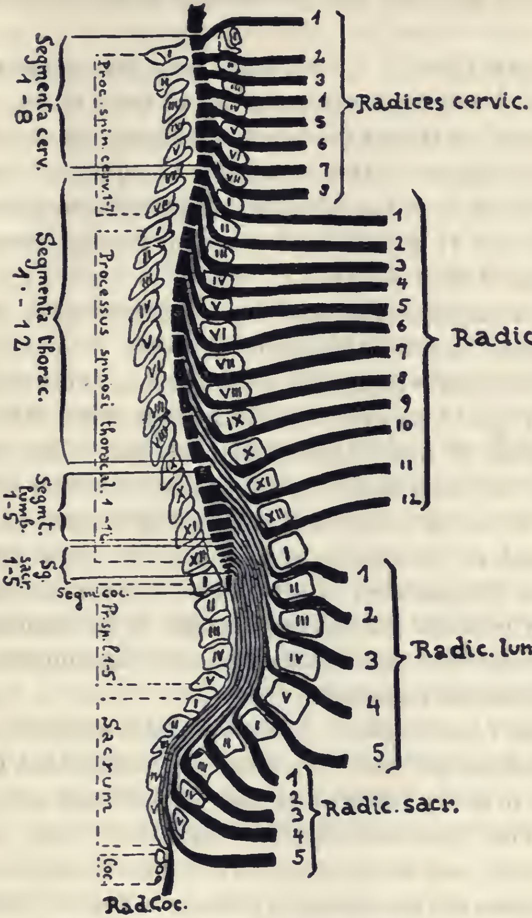

Fig. 364.—Topographic relations of the segments of the spinal cord to the vertebral bodies, spinous processes, and nerve-root origins. This illustration (taken from Robert Bing's work) shows clearly how tumors of the spinal cord and neoplasms or inflammatory processes in the vertebra can give rise to acute abdominal pain.

(*b*) *Tabes with Visceral Crises.*—A recent paper by Nuzum[1] is of great interest in connection with the differentiation of true acute abdominal conditions from visceral crisis of tabes.

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[1] Jour. Amer. Med. Assoc., 1916, 66, 482.

Nuzum has found that in the five years from 1910 to 1915 over 1000 cases of tabes dorsalis have been carefully studied in our Cook County Hospital, and the conclusions arrived at are as follows:

1. Of the 1000 tabetics, 8.7 per cent. have been subjected to laparotomy under mistaken diagnoses one or more times.

2. The "crises" of tabes have largely influenced the surgeon in his decision to operate. This statement is supported by the fact that 65 per cent. of the 87 patients operated on presented visceral crises. In 17 per cent. of these the "crises" were the initial symptom of their disease.

3. Mistaken diagnoses and resulting operations occur chiefly through failure to examine the nervous system.

(*c*) *Hysteria* requires no specific description. I only mention it here to ask you to keep even this condition in mind in the differential diagnosis of acute abdominal affections. The experienced examiner will soon be able to differentiate real from feigned symptoms. But, on the other hand, I have seen hysteric patients wrongly accused of simulation when a genuine acute surgical abdomen called for operative interference. I recall one case in which a highly neurotic woman was thought to be feigning abdominal symptoms until the clinical evidences of an unquestioned generalized peritonitis presented.

(3) *Inflamed Lymph-nodes.*—I mentioned this condition in the previous clinical lecture,[1] and were it not for the fact that I have encountered it in a large number of cases I would not refer to it again here. The symptoms simulate completely those of an acute appendicitis, and are most apt to occur in individuals who neglect to mention the presence of a primary atrium of infection in this territory from which the inguinal and deep iliac nodes receive their lymph.

(4) *Vascular Crises.*—They occur in elderly people in the form of attacks of severe pain in the epigastrium. They are due to an atheromatous condition of the vessels of the splanchnic area, and must be differentiated from other acute abdominal conditions. The attacks may be accompanied by diarrhea and simulate the

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[1] Complications of Appendicitis.

early stage of mesenteric vascular occlusion. The stool at times contains large quantities of blood.

Remarks Upon Patient Presented at Beginning of Clinical Lecture.—I am going to examine this patient again when he is under the influence of an anesthetic. The abdomen has become very much relaxed, but I feel a mass in the right inguinal region which extends over to the median line and downward to Poupart's ligament. In an outward direction it extends to the right border of the right rectus muscle and in an upward direction almost to the umbilicus. The surface of the mass is irregular and firm, not very hard, and is apparently not movable on the underlying tissues. In other words, it seems to be fixed.

Exploration reveals the fact that we are dealing with a case of appendiceal abscess in which the extremely movable cecum has been drawn over to the median line. A greatly inflamed vermiform appendix shows a perforation at its base opposite a phlebolith. A generalized spread of the infected material has been prevented by a mesosigmoid which has come over to the median line near the level of the umbilicus.

This case illustrates the difficulty in diagnosis in acute abdominal conditions when viscera are not in their normal position. This case is especially instructive from a diagnostic standpoint because, as my experience grows, I have learned to consider many other conditions as possible causes of the acute surgical abdomen than we were formerly taught, and I believe that it is advisable for every surgeon to familiarize himself with the various possibilities if he wishes to avoid the pitfalls of diagnosis.

CLINIC OF DR. CHARLES LOUIS MIX

MERCY HOSPITAL

GASTRIC CARCINOMA

Summary: A patient complaining of weakness, pallor, and loss of weight. Demonstration of the method of differentiating carcinoma of the greater curvature.

THE patient is a male, sixty-nine years of age, who entered the hospital on the 19th of December, 1917, complaining of feeling very weak and of losing weight.

Family History.—He was born in Germany and came to Chicago forty years ago, where he has since lived. He has three brothers, all of whom are healthy and living. There is no history of carcinoma in the family.

Personal History.—He is a brewer by occupation, but despite the nature of his employment has always been temperate. He has always been temperate both in the use of food and in tobacco.

Previous History.—He has always been in good health until six years ago, when he had appendicitis and an acute perforation. Notwithstanding the fact that he was sixty-three years of age he was operated upon and made a complete recovery. Before this attack of perforative appendicitis he had been bothered to some extent by gas and distress after eating, but he had never had pain or vomiting. After the operation for appendicitis his gas and distress after eating disappeared completely.

Three years later, in November, 1915, he caught cold and had wry-neck for a few weeks. From this he recovered perfectly. Shortly after this attack he felt himself growing weak. The weakness gradually progressed, and in the fall of 1916 he saw a doctor, who made a diagnosis of pernicious anemia and treated him for it. He was given iron and arsenic for quite a period of time without any material benefit. He kept on losing weight, becoming more and more anemic and short of breath. On December 19, 1917, he entered Mercy Hospital in the service of Dr. Michael McGuire, to whom we are indebted for the privilege of showing this case. At that time his only complaints were weakness, pallor, and loss of weight. There was no complaint of pain or distress after eating. There was no vomiting of food or blood. There was no history of melena at any time, and there was nothing in the bowel movements to indicate any parasitic disease. Venereal history was entirely negative.

On entering the hospital the notes of the examination state that the patient looked very pale, with perhaps a little tinge of yellow in his skin, which was doubtful. The skin appeared rather transparent and very movable on the underlying tissues, due to the absorption of the subcutaneous fat. His lungs were entirely negative. There was a hemic murmur over the precordial region, but otherwise the heart was negative. Examination of the abdomen at entrance showed no definite swelling either on inspection or palpation. On the whole, the abdomen was rather scaphoid. There was a rather large scar resulting from the appendicitis operation, which had stretched and had permitted a slight amount of ventral hernia. No definite tumor could be made out in the abdomen on careful palpation and there was no tenderness. There was perhaps a slight rigidity in the epigastric region over the left rectus muscle. Neither the spleen, liver, nor kidneys were enlarged or palpable. Examination of the eyes, ears, nose, throat, and teeth was negative.

DEMONSTRATION OF CASE

You will note that the patient is a large man, somewhat emaciated, answering questions reasonably promptly, and not appearing to be very sick. The most noticeable thing about him is his color, which immediately prompts a blood examination. This shows 7000 white cells, of which 78 are polymorphonuclear cells, 19 small lymphocytes, and 3 large mononuclear cells. Examination of the red cells shows only 2,000,000 to be present per cubic millimeter, and the hemoglobin is but 40 per cent. This indicates a color index which is slightly below unity and raises the presumption of a secondary anemia, notwithstanding the fact that he was treated for pernicious anemia in the fall of 1916, when he was given iron and arsenic without any benefit to himself. Examination of the red cells shows no nucleated reds to be present. There was no increase in the myelocytes. On the contrary, the only noticeable thing about the red cells was the presence of poikilocytes and megalocytes. Such a blood-picture is the blood-picture of a secondary anemia, though it looks very much like a primary anemia as far as the general appearance of the patient is concerned. When one comes to analyze the blood-picture one finds that the condition must belong to the secondary group. You will also find in the differential examination of the white cells that the change of pernicious anemia is not evident. In pernicious anemia there is always a reduction of the polymorphonuclear cells and an increase of the small lymphocytes, whereas in this patient if anything the polymorphonuclears are increased and the small lymphocytes are diminished. This is directly contrary to the findings of pernicious anemia and raises at once the presumption of a secondary anemia.

His blood-pressure which was taken showed 94 mm. of mercury systolic and 56 diastolic, with a pulse pressure of 38. This indicates again the large amount of secondary anemia which is present and which has resulted in quite a loss of vasomotor tone and myocardial weakness.

Examination of the urine showed a specific gravity of 1021, acid in reaction, there being no albumin or sugar, and no casts or red blood-cells present.

We are at once driven to some explanation for the presence of this very severe secondary anemia. It is quite evident that he must have somewhere about him a bleeding point or else that he has got some malignant disease. The blood differentiation is very evident. It does not come from any parasitic disease of the bowels, because, first, there is no eosinophilia, and second, there have been no ova found in the stools. It must come from some occult point. Had he lost the blood by nose-bleed or by hemorrhages from the bowels or from bleeding piles, he would be aware of it and would readily tell us. Evidently the loss of blood in his case is quite as occult to him as it is to us, and must be sought for. One of the first things to be done in such a situation is to examine the feces for blood. After a meat-free diet this was done, and on the 21st occult blood was found positive; parasites and ova negative.

The presence of occult blood in the stools in an individual who is losing weight, sixty-nine years of age, and extremely anemic ought to raise the possibility in one's mind of some malignant process. Consequently, a test meal was given the patient on the 21st of December, with the following result: total acidity, 16; free hydrochloric acid, none; lactic acid, a trace; occult blood, strongly positive. Such a net of findings immediately raise in one's mind the question of the presence of an achlorhydria of pernicious anemia or an achlorhydria from malignant disease of the stomach.

Let us now note the course of his stay in the hospital. On the 19th of December he came into the hospital in a wheel-chair with a respiratory rate of 24, temperature 97.8 °F., pulse 104. The next day his temperature remained subnormal all day, varying from 97.6° to 98° F.; his respiratory rate from 18 to 22, and his pulse from 78 to 100. On the 21st of December his pulse varied from 80 to 82, showing the effect of rest in bed upon his myocardium. Subsequent to that date we find that his pulse range continued low, falling even as low as 62 on the 23d of December, again illustrating the value of rest. From that time until the present (January 9th) he has been doing reasonably well, being up part of the time, sleeping fairly well, getting an occasional alcohol rub, and taking his meals without a great deal of trouble. Today, on the 9th, he has made quite a little improvement in the blood count. It shows 2,504,000 reds with 50 per cent. hemoglobin. A differential count of the red cells, made especially so that we may have the results this morning, showed 9 poikilocytes, 4 megalocytes, 9 microcytes, 68 normocytes per 100 cells. This is not the picture of pernicious anemia, but the picture of secondary anemia. You will note there was only 4 per cent. of megalocytes, whereas in pernicious anemia the megalocytes are 40 per cent. or more. You will note also that the hemoglobin and erythrocytes are practically in normal relationship. There were 2,504,000 red cells and 50 per cent. hemoglobin.

The finding of blood in the feces together with the gastric analysis led, of course, to the fluoroscopic examination of this individual, and when the fluoroscopic examination was made the whole case was greatly illuminated. Before speaking, however, about the results of this examination I wish to say a few words in regard to the localization of gastric carcinoma. Depending upon the location of gastric carcinoma is the symptomatology. If the carcinoma lies in the fundus it almost invariably is located at the cardiac orifice. It usually starts from the columnar cells which lie just within the junction of the esophagus with the stomach. Many so-called cancers of the esophagus in the lower portion are really cases of cancer of the stomach at the cardiac orifice, because on examination they will be found to be made of columnar epithelial cells. Carcinomata situated in such a location can close in the surrounding tissues and produce a great deal of pain and are almost universally diagnosed as esophageal carcinomata. They are usually very prone to bleed and lead, as a rule, to frequent and repeated hemorrhage. They bear out the law of carcinomata everywhere of small repeated hemorrhages rather than a very rare large hemorrhage. Often in these cases the blood comes up in small amounts through the esophagus and is vomited out by the patient.

When the carcinoma is situated on the greater curvature the symptomatology is frequently very latent. There have been numerous cases reported in the medical literature of operations in which the surgeons have been surprised to find a very large tumor of the greater curvature which was not suspected. If the tumor mass is not very tense and if the abdominal wall is set rather firmly, so that palpation is not easy, these tumor masses are not infrequently overlooked. I have known of instances of large tumor masses not being found on the greater curvature by physical examination, but disclosed at the time of operation. If the carcinoma is located on the greater curvature, it usually gives no symptoms on the part of the stomach. It does not apparently interfere very much with peristalsis. It does not ordinarily give rise to much pain until the stage of ulceration is reached, and even then there may not be very much suffering attached to its presence. When the carcinoma is situated on the lesser curvature, however, it usually runs a very intense course. There is apt to be a great deal of vomiting, a large amount of pain, and considerable interference with gastric peristalsis. Usually carcinomata situated on either the lesser or greater curvature do not materially interfere with closing or opening of the pylorus. In fact, carcinomata of the greater curvature are apt to result in a rather open pylorus, whereas those on the lesser curvature, depending on their location, may or may not lead to secondary narrowing. If a lesser curvature tumor is located near the pylorus it, of course, will exert a certain effect upon it. When the carcinoma is situated in the antrum pylorici or at the pylorus it produces its worst effects. Usually in these cases it leads to a gradual dilatation of the stomach until the stage of marked stenosis is reached. These individuals may for a long period of time be able to get rid of the contents of their stomach in the natural way and then comparatively suddenly may get a severe pyloric blockade with a very rapid accumulation of fluid in the stomach, so the organ becomes dilated to an enormous size. I remember on one occasion I was examining a patient at the County Hospital in the recumbent posture. He had what seemed to be a large abdominal cyst, which extended as far down as the right iliac fossa. It occurred to me that the thing might be a dilated stomach. We put in a stomach-tube and, to our surprise, we took out about a gallon of black water. It is needless to say that this patient had an almost completely occluded pylorus from a carcinoma, and when I tell you that he died within three weeks' time of an acute blockade which took place rather suddenly without much preliminary trouble you will not be surprised at the outcome. We had also in Mercy Hospital about a year ago a similar case where the man went along with his carcinoma for a number of months and then, comparatively suddenly, he had a complete pyloric stenosis. Then rapid dilatation ensued, with comparatively early death.

One would say, then, from these considerations in the case of this man that a large carcinoma of the stomach is suspected by reason of the anemia, loss of weight and strength, and that it would be more likely that the carcinoma would be in a portion of the stomach where it would not give rise to symptoms as were it found in a portion of the stomach where it would give rise to a great deal of disturbance. Inasmuch as blood is found in the feces and has been found whenever looked for, it is evident that the loss of blood which this man complains of is due to bleeding from the carcinoma. This means then that if we find a carcinoma we have one which is a bleeding carcinoma with a raw surface opening into the stomach.

We are still further strengthened in the hypothesis of the probable presence of carcinoma by reason of the fact that the loss of weight in this patient's case has been quite considerable. In pernicious anemia loss of weight and subcutaneous tissue is the great exception and not the rule. Almost all the pernicious anemia cases maintain their subcutaneous fat, or at least have enough subcutaneous edema to give the skin a fairly normal appearance, whereas in carcinoma cases the complete absorption of subcutaneous fat usually leads to an appearance of quite intense emaciation. In this patient the complete absence of subcutaneous fat raises the presumption of the presence of carcinoma.

We are now in a position to tell you the results of the fluoroscopic examination and to show you the plates which were made on the same occasion. When the bismuth and buttermilk were given to him to drink, they passed down the esophagus without any trouble. They entered the stomach through the cardiac orifice and passed along the lesser curvature and started into the duodenum, very little remaining in the stomach. It seemed almost as though there were no stomach, the bismuth and buttermilk passing through a very patent pylorus, which apparently made no attempt whatever at contraction into a duodenum. From the fluoroscopic examination one would say without question that the pylorus was wide open and without function. The most important point, therefore, is the distribution of bismuth in the stomach, and since that shows very nicely in the x-ray plate, we will ask your attention immediately to the two radiograms which were made. You will note in the radiogram that the stomach is somewhat large, with a well-developed broad fundus. The stomach shows no stomach bubble. You will notice the little angle at the junction of the fundus with the lesser curvature, which marks the opening of the cardiac orifice into the stomach. At the pyloric end of the stomach you will see that the pylorus is very markedly open and that a large amount of bismuth in the five-minute picture has already passed into the duodenum. The most noticeable and spectacular point in regard to the whole picture, however, is the very large filling defect which is noted in the region of the greater curvature. You will see that there is a distance of approximately 4½ inches in length along the greater curvature in which no bismuth appears running in. From what ought to be the normal line of the greater curvature of the stomach there is a filling defect extending to a depth of approximately 2¼ to 2½ inches. In the center of this filling defect you will notice there is apparently a crater of bismuth which communicates with the cavity of the stomach. This bismuth crater is very irregular in outlines and suggests that the bismuth has made its way into the ragged, fissure-like cavity, extending into the center of the tumor mass (Fig. 365).

Such a huge filling defect, of course, can be due to but one thing. There must be a very large, comparatively soft carcinoma situated in the region of the greater curvature, which has ulcerated in its interior and which is pouring a certain amount of blood into the stomach constantly. Into the cavity of the tumor mass the bismuth has made its way and shows in the x-ray plate.

Noteworthy points in this patient's case aside from the x-ray plate, which is a most striking example of a filling defect in carcinoma of the stomach, is the complete absence of symptomatology. This patient has been treated for something over a year for pernicious anemia, which it was evidently thought that he had. Of course the findings of the blood do not bear out this diagnosis, but, on the other hand, the negative statement from the point of view of his gastro-intestinal canal and the negative findings in the abdomen indicate nothing of the presence of a carcinoma. Of course the error of supposing that pernicious anemia might be present was one in which a man who was not very careful in his work might readily fall. As soon, however, as one begins to examine the blood-picture, he discovers that the case is one of secondary rather than primary anemia. Then the matter of a search for the cause of the blood-picture becomes a matter of consequence. Taking into consideration that in pernicious

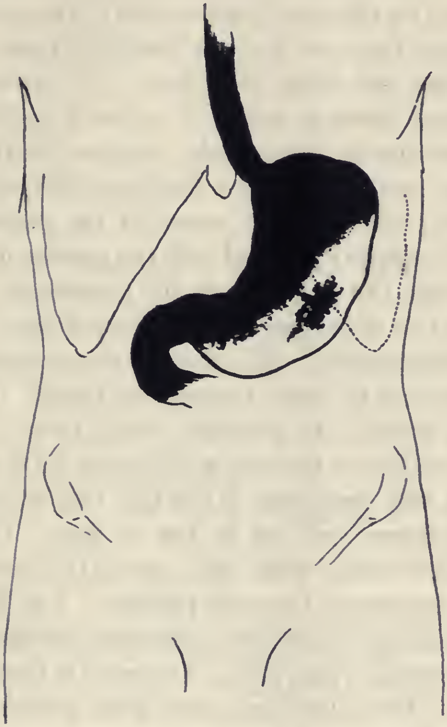

Fig. 365.—Diagram of *x*-ray plate showing filling defect on greater curvature and bismuth-filled crater in the defect.

anemia you do not have a marked emaciation, and in this man's case there is a great deal of emaciation, one is immediately confronted by the possibility of malignant disease. Such malignant disease might be, of course, in the genito-urinary tract or in the alimentary tract, but inasmuch as he has had no symptomatology on the part of the bladder, one would not think of looking for a vesicle polyp or a tumor in this man's case. We would rather turn at once as we did to a consideration of the stomach and intestines, trying there to find the bleeding point. The *x*-ray picture explains one thing very nicely. It explains why this patient has gone along so well with so much pathology. If his carcinoma were situated in any other location than the one which it occupies, he would have had a great deal of symptomatology, but inasmuch as it lies in the region of the greater curvature, where it has in nowise interfered with the passage of the stomach contents through the pylorus into the duodenum, it, of course, has occasioned no disturbance. He does not have pain because he has no hypermotility. His stomach seems under the fluoroscope to be merely an inert, functionless funnel. If there were motion in his stomach he doubtless would have a good deal of pain, but since there is no motion whatever, he is without pain. Interesting in this connection is the fact that he clearly has an ulcerated carcinoma and yet he has no pain. Evidently carcinomata of the fundus when they are in the stomach are like carcinomata elsewhere; they are painless. You know, for example, that it is not the rule in carcinomata of the breast for the patient to complain of any pain. The same is true of carcinoma of the uterus. The patient may have quite a large uterine carcinoma and be unaware of its presence because of the complete absence of pain. In fact, carcinomata in general are insidious in origin and do not betray their presence by anything but the size of the tumor masses which they give rise to. In the case of this patient the carcinoma has but followed the usual law of painlessness. Contrary to the old text-book idea, gastric carcinomata are by no means always painful. Many of them run a perfectly latent course up to three weeks before the death of the patient. In not a few instances postmortem examinations have occurred in which carcinomata of the stomach have been found for the first time after the patient's death, being unsuspected in life.

The practical points which are to be derived from the demonstration of this patient's case are, first, that carcinomata of the greater curvature may run a perfectly latent, painless course even when they attain enormous size. Second, that carcinoma of the stomach can suggest the diagnosis of pernicious anemia, but when a careful examination is made of the blood findings in such a case, it will be found that the case is really one of secondary anemia. It will also be found in such instances that there are no cord changes. Cord changes almost invariably accompany severe cases of pernicious anemia, but are never associated with cases of secondary anemia. The complete absence of any cord changes in this man's case raises the presumption of a secondary anemia. Third, the necessity of fluoroscopic and *x*-ray examination as a matter of routine is apparent. Had an *x*-ray examination not been made in this case the diagnosis of gastric carcinoma could only have been suspected. It would never have been made. The absence of pain, vomiting, and tumor masses, notwithstanding the apparent large size of the carcinoma, would have suggested that nothing pathologic would be found in the stomach, and yet when the fluoroscopic examination was made it was immediately apparent to everybody present that there was a severe disease of the stomach.

We are very much indebted to Dr. Michael McGuire for the privilege of showing this case, which is on his service, and for the observations and the history which were made by him.

CLINIC OF DR. EMMET A. PRINTY

LABORATORY OF SURGICAL TECHNIC

DEMONSTRATION OF A PERFECTED TECHNIC FOR POSTERIOR GASTRO-ENTEROSTOMY AND FOR CHOLECYSTOTOMY

Summary: Desirability of standardization of surgical measures; posterior gastro-enterostomy; skin incision and arrangement of towels; ideal location and direction of stoma, management of opening through transverse mesocolon; incision into stomach and jejunum—control of hemorrhage and details of the introduction of sutures; excision of mucosa as an aid in preventing subsequent closure of stoma; a new needle forceps.

Cholecystotomy: Fundus of gall-bladder brought out of wound—protection of field of operation; advantages of spreading trocar wound with scissors over direct incision in gall-bladder; removal of gall-bladder contents; drainage-tube—its introduction and suture made safe and easy by threading over solid glass tube; closure of abdominal wound—the preliminary mattress tension sutures.

June 19, 1918.

I BELIEVE there is a definite need for the standardization of the more common surgical procedures and that a technic which fulfils at all times and in any case the various requirements, such as hemostasis, asepsis, avoidance of unnecessary trauma, and the shortening of the time of operation, should be perfected and whenever possible adhered to. I have used a fixed routine for some time in performing gastro-enterostomy and another for cholecystotomy, and have found each to fulfil all requirements.

For gastro-enterostomy we make the usual incision just to the right of the midline, and after cutting through the skin we change our knife and complete the incision. Then we apply towels in order to keep the abdominal contents from coming in contact with the skin. We place them from this side over to the opposite side and grasp the edge of the skin and the towel with towel forceps. When we turn the towel back the towel forceps are out of our way. We do the same on the opposite side. As we put in our retractors the stomach comes into view.

The next thing to determine is the position of the proposed gastro-enterostomy opening. This varies with the contour and condition of the stomach. As a rule, if we draw a line directly downward from the right side of the esophageal orifice, that line crosses the greater curvature at its lowest point, and it is there that we must make our opening—as close to the greater curvature as possible and at its most dependent portion. Having chosen the position for the anastomosis, we lift up the omentum. That brings up the transverse colon. We pull that up a little more and expose the transverse mesocolon. As we pass our hand to the left and backward we strike a point of fixation and bring up the first loop of jejunum. Pressing on the anterior wall of the stomach we push its posterior wall against the transverse mesocolon. Puncture of the transverse mesocolon now exposes the posterior wall of the stomach. We once more identify the lowest point of the greater curvature and hold it up with Allis forceps. We are going to make the direction of our opening downward from right to left (Mayo). In some cases this direction of opening is impracticable either on account of the position or condition of the stomach or on account of the variance in the point of exit of the beginning of the jejunum. This forceps to the left locating one end of the proposed stoma is at the greater curvature, and the one to the right is 1½ inches away from the greater curvature. We put our clamps on the stomach portion and bring up sufficient stomach to work with. At this stage we sew the posterior portion of the opening in the transverse mesocolon to the stomach with a few sutures (Fig. 366, 1). This edge is to be drawn up close. We make a half-circle well back of the clamp. If our mesocolon is very thick, we can invert the cut edge just as we would put in a Lembert in the intestine. This opening must be closed in order to prevent a postoperative hernia of the intestine through it. We close the remainder of that opening later.

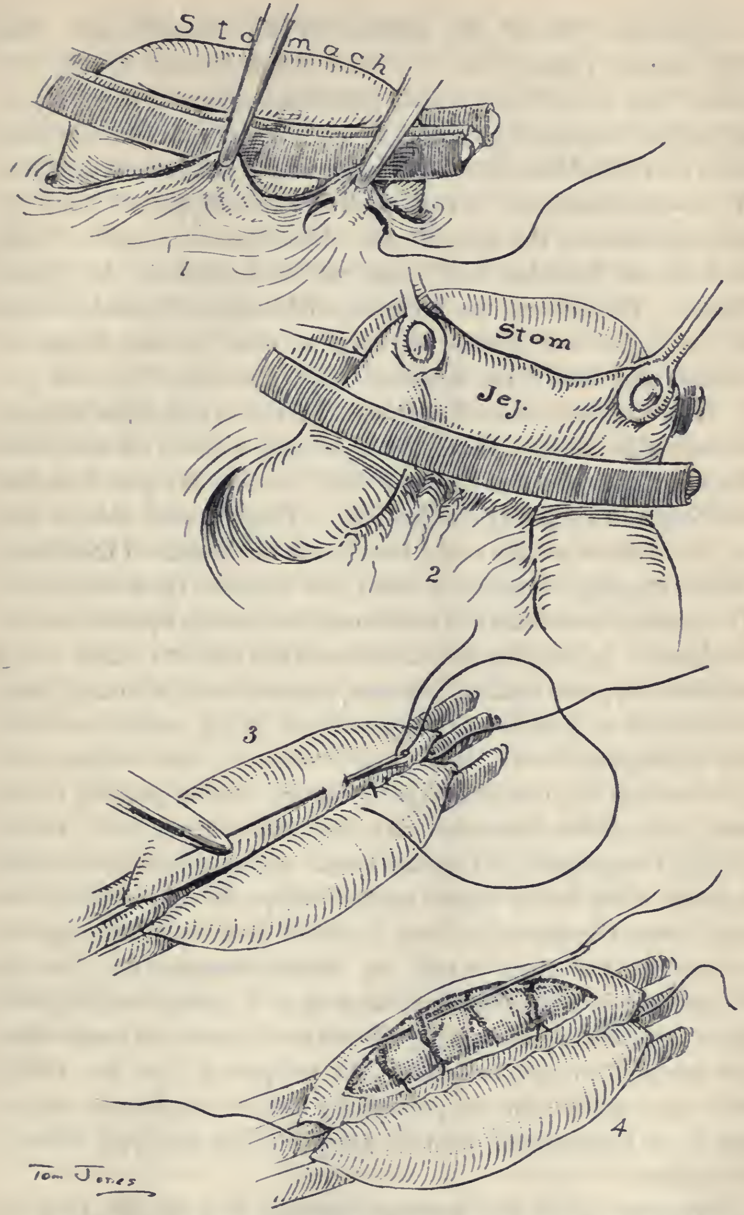

Fig. 366.—1. Sewing posterior edge of rent in mesocolon to posterior wall of stomach, behind the clamp. 2. Bringing jejunum into clamp. Distal portion of loop corresponds to tip of clamp. 3. Cushing suture and method of using Mayo needle forceps. 4. Vessels exposed and ligated.

The first loop of the jejunum is now brought up. This loop usually passes from the fixed point directly to the left, toward the left kidney. That means we must make our opening in the stomach from right to left. If we find that the ligament of Treitz binds down this loop, we cut it between ligatures. We always endeavor, in making this anastomosis, to make the opening more on the anterior side of the intestine, so that when we turn our intestine back there will be no kink at the jejunal flexure. We pick up the jejunum with rubber-covered forceps. In putting on our clamp we keep as close to this flexure as possible and stretch the intestine before clamping (Fig. 366, 2).

Now we must wall off our field. We first put moist sponges at each side of the clamp. Then we put a towel on each side. We use a special towel called a "lap" towel. We put it around the clamp in that way (indicating). Then to each side of that we put another sponge and a towel over the handle of the clamp. Before starting to suture I want you to note these directions. The greater curvature of the stomach is passing upward toward the heart. In starting the suture we take the first stitch across the line of approximation between stomach and jejunum, being careful not to puncture the lumen and being careful to catch the submucous coat. We place forceps on that suture end. Now we use the Cushing type of suture, sewing parallel to the long axis of the intestine. We find that this type of suture quickly buries itself and makes a neat suture line, with no linen exposed. We use a Mayo needle forceps in our left hand to push away the intestine, then to make counterpressure against our needle, and then to pull our needle through (Fig. 366, 3). We make this first suture line from 2½ to 3 inches long, depending on the size of the opening we want, as it must be longer than the opening we are to make. As we put in our last stitch, before pulling it tight, we pull on the loop to see that our suture line is as tight as we want it; then we lock and pull directly backward.

We then make our opening, starting first on the stomach side, beginning about ⅛ inch from the suture line and the same distance downward from the knot, cutting only through the outer coats down to the submucosa. As we cut down to the submucosa the mucosa commences to bulge out, and we can see running across this incision numerous large blood-vessels. Before finishing the incision into the stomach and severing these vessels we ligate them, which is considerably more of a conservative procedure than letting the suturing control hemorrhage from them, especially as the suture might miss the large ones. Now in ligating these we ligate first on the side nearest the greater curvature, keeping close to the cut edge for the reason already given. We pass directly beneath the vessels with our suture and securely tie them off (Fig. 366, 4). If the vessel is large we also ligate the opposite extremity, as the collateral circulation of the stomach is so great that we can have severe retrograde bleeding. Now we feel a little more secure as to the occurrence of postoperative hemorrhage. Then we do the same thing on the jejunal side. We are now ready to complete our opening into the stomach and jejunum. In making our opening into the stomach we place the Allis forceps at each corner, grasping the mucosa and lifting it up. Then with a scissors we snip across one corner, making a small opening into the lumen. Then introducing one blade of the scissors into the lumen we cut around it (Fig. 367, 5). While doing this we are careful not to destroy our ligatures. Now we have excised the mucosa. This safeguards against subsequent and premature closing of our new stoma. Now, having carefully sponged the stomach and intestine, being careful not to scrape or traumatize the mucosa, we are ready for our inner row of sutures, which are especially for hemostasis. We place the Allis forceps on the two inner flaps below to hold those parts up for us. We sometimes paint between the inner flaps with a little iodin. We begin our suture on the outside, passing directly into the lumen at one corner a fair distance from the cut edge. Then we pass through both of our posterior edges and then come out on the opposite side, making somewhat of a U (Fig. 367, 6). When we tie that we have almost a purse string. We also find by having our knot on the outside that we are better able to tell when completing the suture whether

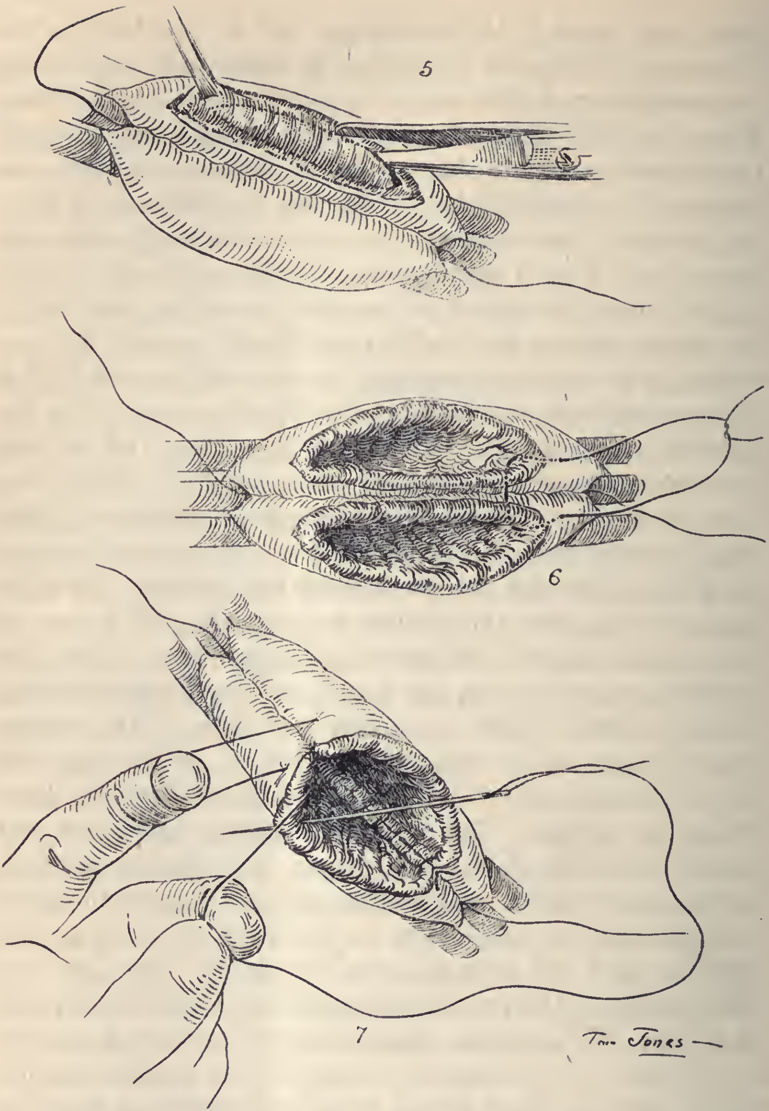

Fig. 367.—5. Excising ellipse of mucosa. 6. Author's "R" stitch at beginning of inner row of sutures. 7. Author's method of holding loops while introducing Connell suture.

we have actually gotten completely around and turned in all the cut edges. Now we enter the lumen and whip up the posterior edges. We lock this occasionally to prevent the suture from slipping, and it also has the added hemostatic value of the locked suture. You can see that this whip stitch has a tendency to roll over the mucous edges and leaves this with a much smoother appearance than we get with the old type of Connell suture. Now we loosen the clamps to see if the posterior edges are going to bleed. If there is any bleeding-point we will put a mattress suture through and tie off the vessel.

Now we whip around this corner until we have practically started back on the anterior edges of our incision; and then we change to the Connell suture by coming outside and then crossing to the other side. From here on we use the Connell suture, and this suture is put in in the same direction as the Cushing suture was applied, except whereas the Cushing suture is not a through-and-through suture, the Connell is. It goes directly in and then out for the purpose of hemostasis and rolling in the cut edges. We put this in in a slightly different fashion from the usual way, dividing the stitch into two parts, one with the needle passing through into the lumen and the other out. It is put in as follows: The left hand is holding the suture taut. The needle is now thrust into the lumen, and while pulling this portion of the suture through, the loop is engaged by the second finger of the left hand, while the thumb and index-finger of the same hand grasp the suture a few inches from the needle (Fig. 367, 7). This gives us the effect of tissue forceps for holding up the cut edge and steadying it for the subsequent outthrust of the needle. The suture is now pulled entirely through, and again held taut by the left hand. This enables us to put in a very accurate and rapid Connell suture. It avoids the necessity of steadying the cut edge with forceps, thereby avoiding traumatization and scraping of the cut edges, which tends to produce more bleeding and possibly is a factor in subsequent ulceration. As we come toward the end of this suture you can see how the anterior edge is turned out for us by this loop. We now lift up on the original end of the thread so as to bring the knot which marks the beginning of the suture line into view.

We know when we reach that point that we have turned in all the cut edge. We then tie and cut off the ends.

We next clean our field by removing all soiled sponges and towels and loosen the clamps to avoid a too prolonged pressure. Then we change our gloves, as we have found it difficult to remove all dry blood and stomach or intestinal contents by merely washing. Our work from now on is clean work and our hands should be clean for that purpose. On returning to the table we inspect our suture line to see that all edges are turned in and that there is no bleeding. After washing off the field we sometimes paint the suture line with iodin before reinforcing with our last suture. Now we pick up the first suture (which was folded in the towel) and come back with the same Cushing suture that we first started. When sewing with straight needles I occasionally make use of my new type of needle forceps (Fig. 368), which I have found very handy for use with a straight needle (Fig. 369, 1). It gives a better purchase on the needle and avoids trauma to the gloves. We also use it for a curved skin needle in closing up our abdominal wound (Fig. 369, 2). An added advantage of this forceps is that in tying our sutures we do not need to lay the needle forceps aside (Fig. 369, 3). We can also use it like a thimble. Now we place an interrupted suture at each corner to take the tension off our suture line and to approximate more jejunum to the stomach as a preventive of a sharp angulation. Then we inspect our last suture line

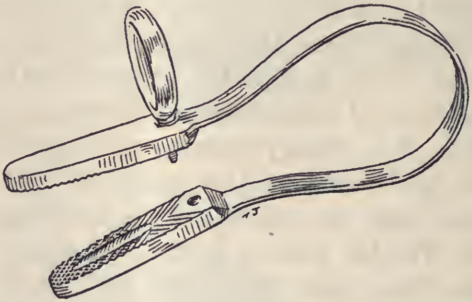

Fig. 368.—Author's needle forceps for use with straight or curved needles.

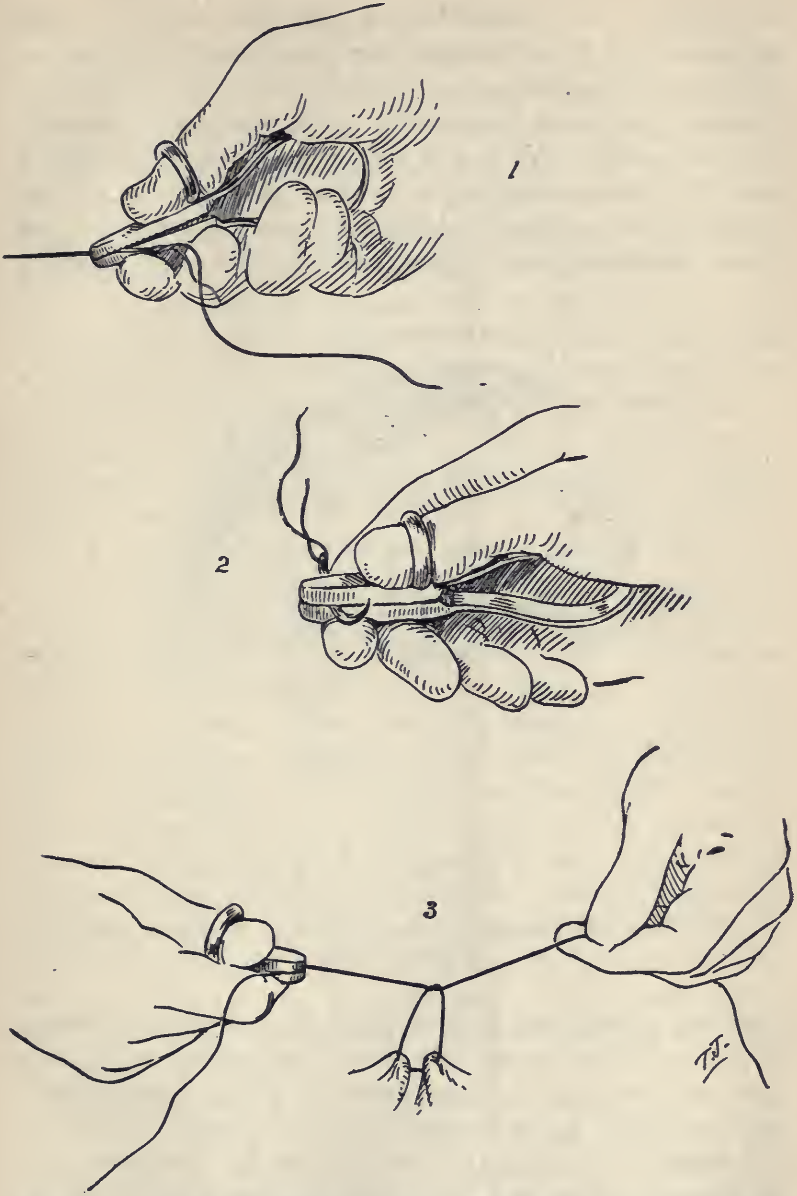

Fig. 369.—1. Position of straight needle in special forceps. **2.** Method of holding curved needle. 3. Method of tying.

for bleeding. We already have a very slight blood-clot along the suture line which is a great help in sealing our new opening. We inspect the posterior row of sutures and make sure that the posterior portion of the opening in the transverse mesocolon has been closed. We find it convenient to close the anterior portion of the opening now with interrupted sutures. Having made sure of our closure of the transverse mesocolon, we then restore the structures to their position within the abdomen.

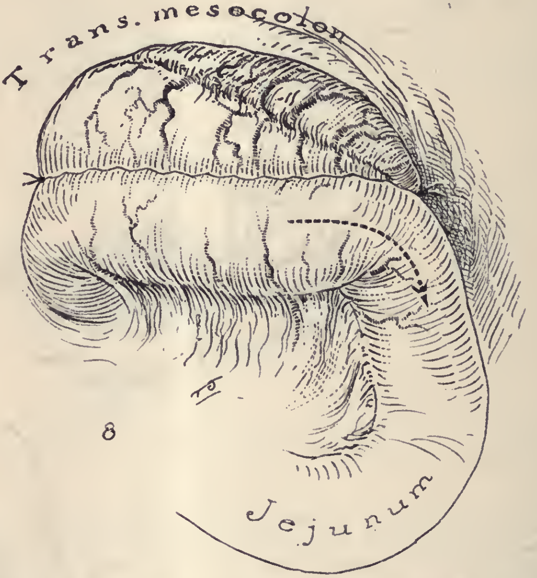

Fig. 370.—The completed anastomosis. Direction of opening and relation to greater curvature.

From the anterior surface of the stomach we can see no evidence of our work, but we can feel close to the greater curvature a good-sized opening which easily admits the tips of three fingers. It is not a slit, but a punched-out, oval opening. Lifting up the omentum we can see that the jejunum has been restored to its original position and that there is no kinking or pulling at the junction and no loop between the fixed point and our anastomosis (Fig. 370).

CHOLECYSTOTOMY

In working upon the gall-bladder for the purpose of drainage we endeavor, if the gall-bladder is of the long type, to bring the fundus above the level of the abdominal wound, surrounding it with sponges, and fastening these on either side with forceps, catching a little of the peritoneal covering of the gall-bladder at the same time. We find that that completely shuts off the peritoneal cavity. After placing Allis' forceps on each side of the fundus we steady the fundus while we plunge in our trocar and aspirate the contents (Fig. 371, 1). Now instead of enlarging this opening by cutting with a knife or scissors we merely insert a scissors or forceps into the small opening made by the trocar, and stretch the opening to the size we want it. We have much less bleeding from such a procedure and we find the opening conforms itself better to the tube which we expect to introduce. Now we grasp the edges with our clamps. Holding these up to prevent the escape of bladder contents, we take a narrow piece of gauze and introduce it into the depth of the gall-bladder, thereby sponging out all the remaining contents. Sometimes we bring out small gall-stones. Now we take a large spoon and remove the stones. If we find them especially hard to dislodge, we can place one finger outside of the gall-bladder, and with a scoop inside we can dislodge the stones which have become impacted in the wall. After having brought out all the contained material we place a finger-cot on the index-finger and introduce the finger into the gall-bladder. That is the best way of ascertaining the condition of the gall-bladder mucosa. We feel down against the cystic duct and we feel against the liver. We can determine more of the condition of the mucosa in this way than we can with a spoon. Then we withdraw our finger and remove the finger-cot.

Having determined that this gall-bladder may be left behind, we introduce a drainage-tube. We use a specially prepared tube, the special preparation consisting in introducing a metal or a glass rod which is slightly smaller than the diameter of the tube itself (Fig. 372). We find that this is a great help with the flexible tube. We find the tube easier to introduce

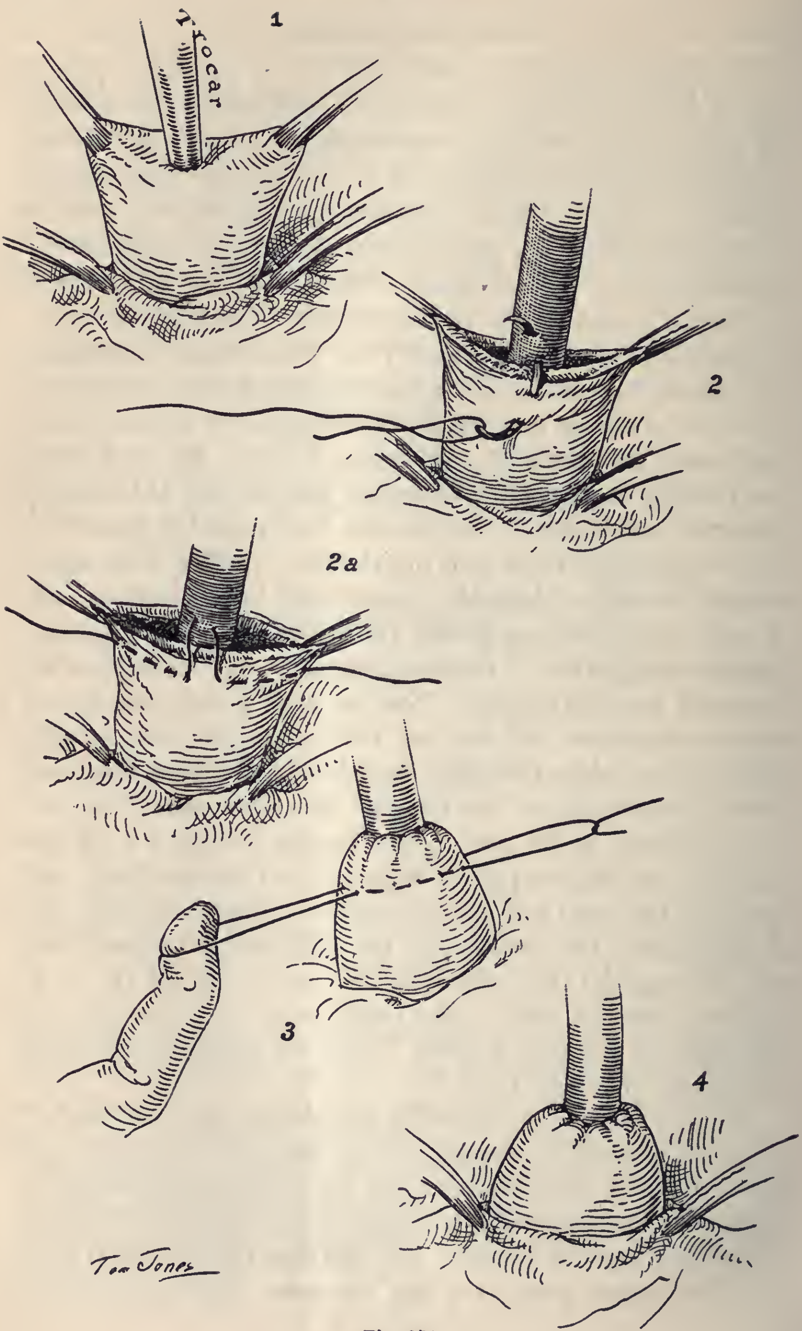

Fig. 371

and easier to hold in position; it facilitates the introduction of sutures, and it also helps when inverting the cut edges with the purse-string suture. This idea was originated by Dr. Boyd S. Gardner, formerly of this laboratory. During the four or five years that we have used it we have become more and more aware of its numerous advantages. Now we introduce three interrupted sutures of plain catgut to anchor the tube to the gall-bladder. We introduce the tube a distance of ½ to 1 inch. We put our anchoring stitches into the gall-bladder serosa just as we would put a Lembert in the intestine and then introduce the needle into the tube and the glass rod turns the needle directly out (Fig. 371, 2). Introducing our stitch in that way gives us a primary inversion of the cut edge. I sometimes make use of my new purse string which gives a little more accurate approximation (Fig. 371, 2*a*). We use for this a straight needle threaded with plain catgut. Starting ⅛ inch away from the cut edge, we put in three stitches, then we come up and take a stitch in the tube and then come back and take three more in the gall-bladder. After every three stitches into the gall-bladder we come up and take a separate stitch in the tube. We find this stitch gives us the same turning in with a more accurate

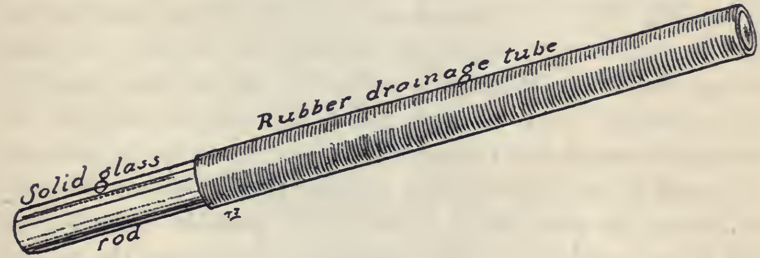

Fig. 372.—Rubber drainage-tube rendered non-flexible by insertion of solid glass rod.

Fig. 371.—1. Aspirating contents of gall-bladder with Ochsner trocar. 2. Fixation of tube to gall-bladder and inversion of cut edges. 2*a*. Author's purse-string for fixation and inversion. 3. Ready to invert second purse string. 4. Inversion completed.

approximation of the gall-bladder to the tube. We now have our tube anchored to the gall-bladder and we have a primary inversion of the cut edges and a fairly good approximation. Now we put in a second purse string of chromic gut, or if we have used interrupted stitches to connect the gall-bladder to the tube, this would be our first purse string. If the assistant picks up little folds of the gall-bladder wall, we can introduce our purse string with great ease. All the time we are working the rubber tube is closed by the glass rod, so that no gall-bladder contents are leaking into the field of operation. When we reach the point opposite the starting place we pull through our needle so as to leave a loop of thread. Now the assistant pulls up the loop of our suture and holds up the tube while we are preparing to tie (Fig. 371, 3). This rod reinforces the rubber tube and we find it very easy to invert the rubber tube and tie our purse string, whereas in the case of a flexible tube we often find the tube bending. Now in tying this suture we find another advantage from the fact that no matter how tightly we tie, we cannot constrict our rubber tube. Leaving the rod still in the tube, we return the gall-bladder to its normal position (Fig. 371, 4). We do not anchor it to the peritoneum, but close the wound around it in the usual way. We make sure that the tube does not emerge from the wound at a point too close to the rib or liver margin, as in that case the liver edge with each inspiration will be pushed against the fixed gall-bladder. We do not bring our tube too far down in the wound, as that might cause a kinking at the junction of the cystic duct and gall-bladder. This rod can be removed immediately or left in until the patient is returned to bed and the tube with bottle arrangement is about to be attached.

In closing the peritoneum I sometimes make use of an original method which is a great help when the peritoneum is friable and tears easily. We grasp the cut edges of the peritoneum and posterior rectus sheath with forceps and put in a mattress suture. We place three mattress sutures through the peritoneal edges, one near each extremity of the wound and one near the center (Fig. 373). We tie the center one first and then the other two and find we have accomplished two things: First, we have taken off the tension, and second, we have everted the edges. Now, the edges being well everted, we can use an ordinary running suture to close up the peritoneum without the necessity of putting in our sutures in such a way as to produce an ectropion. The mattress sutures also aid in keeping back the viscera as we are sewing up the opening, and they reinforce our continuous suture.

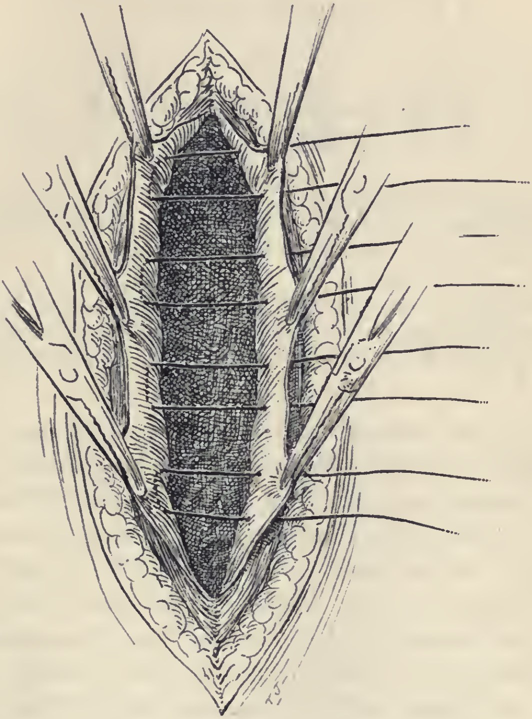

Fig. 373.—Closure of peritoneum. Mattress sutures carried through peritoneum and posterior rectus sheath evert the edge and greatly facilitate closure.

CLINIC OF DR. EDWARD L. MOORHEAD

Mercy Hospital

EXSTROPHY OF THE BLADDER—3 CASES—SURGICAL RESEARCH REPORTS

Summary: Incidence, pathologic anatomy, and diagnosis of exstrophy of bladder. Treatment—skin plastics unsatisfactory; technic and results of the Maydl operation. A case of exstrophy of the bladder in a patient who has borne children.

Surgical Research: Ascending renal infection a result of faulty technic. Isolated intestinal loops—the detoxicating effect of the liver. Simultaneous transplantation of common duct and posterior pancreatic duct in dogs. Pancreatic diabetes.

One of the more unusual and at the same time unfortunate surgical conditions which we are called upon to relieve is exstrophy of the bladder. This condition is a congenital defect, the diagnosis of which is to be made by inspection. It occurs once in about 29,000 births. Five males to one female are so afflicted. That the male generative organs are more complex, that deficiencies in the anterior median line occur most frequently in the male, and that deficiencies in the posterior median line occur with more frequency in the female sex, probably account for this difference. The appearance is characteristic at the first glance. In the pubic region, where the symphysis should be, there is a round, red, vascular projection of mucous membrane, which becomes more prominent when the child cries or strains. On the front of this are the ureteral orificies, with drops of urine falling from them at regular intervals; above is the linea alba, generally very much widened, so that the two recti are far apart; below is the flattened penis, with the urethral groove on its surface, and the openings of the prostatic follicles; and on each side is a rounded projection caused by the pubic bones, which do not meet in the middle line.

The testicles may be in the scrotum or in the inguinal canals, and there may be a hernia as well on one or both sides. The thighs are widely separated from each other, so that the gait is waddling, and if the skeleton is examined the obturator foramina are found to be smaller than normal, the iliac bones straighter, and the pubic bones separated by an interval of from 2 to 4 inches.

In the female the appearances are so much the same that sometimes there is a little difficulty in determining the sex. The testes, however, or the body of the uterus, as the case may be, can usually be made out without much difficulty.

In older cases the skin becomes excoriated; the surface of the projection becomes rough and granular from the constant friction and irritation to which it is subjected; papillary growths spring up around the ureteral orifices, so as to cause a slight degree of obstruction, leading to dilatation of the ureter and later involvement of the pelvis and secreting substance of the kidney.

An exstrophied bladder may become carcinomatous. A few cases have been reported. The mortality during infancy is 60 per cent.

This congenital defect is best explained on a mechanical basis—an intra-uterine rupture of a completely formed bladder. The first stage in the process is the closing up of the urethra, causing retention of urine. The pubic bones, at this time scarcely cartilaginous, and still ununited, are kept apart until they become hardened. At the same time the rectus muscles are kept apart, so that little by little, by the intravesical pressure of urine, the bladder presses against the abdominal wall and finally ruptures and forms adhesions to the borders of the split.

In the treatment of this condition many attempts have been made to reflect flaps of skin to cover in the opening and form an anterior wall for the bladder; of these, the most successful is Woods, but even with this, the greatest benefit that can be hoped for is the formation of a cavity which will retain urine for a short time with the aid of an appliance into which the urine will drain. Trendelenburg advocated the division of the sacro-iliac synchondrosis from behind, and the gradual approximation of the pubic bones by properly contrived splints until the sides of the cleft are sufficiently close to be united. The operation is performed during infancy.

Since Maydl in 1892 first successfully transplanted the vesical trigon into the sigmoid colon in a case of exstrophy of the bladder, this method—in some instances modified—has been followed in 152 cases collected from the literature, and the 2 cases which we show you today.

Of the total number, 129 were males (five of adult age); 25 were females (7 of adult age); 44 patients died—a mortality of 28.5 per cent. Deaths were attributed to: pyelonephritis, 21; general peritonitis, 8; chloroform narcosis, 1; pneumonia, 3; hemorrhage, 1; pulmonary embolism, 2; other causes, 8. The functional results in 3 who recovered were good.

The longest period of observation of patients was seven years. The originator of the technic reported 10 cases—an unusually large number; 12 cases were contributed by seven American surgeons.

We are fortunate to be able to show you 2 cases today, one of which we operated according to a modified Maydl, and the other one was operated several times by plastic methods. By this you can see the futility of the old method of attempts to form an anterior bladder wall by plastic operation.

Before showing these cases I will give you the history of another male case:

Case I.—H. L., man, age twenty years, whose family history was negative, had had no illness since childhood, and always lived on a farm, doing the usual work. The disagreeable odor caused by decomposing urine prevented his attending school. He could neither read nor write. The extreme sensitiveness of the exposed bladder mucosa did not tolerate the wearing of trousers, and a dark colored loose fitting skirt reaching to just above the ankles was worn instead. His gait was waddling. A catheterized specimen of urine contained nothing pathologic. Surgical treatment of this patient during his earlier years,

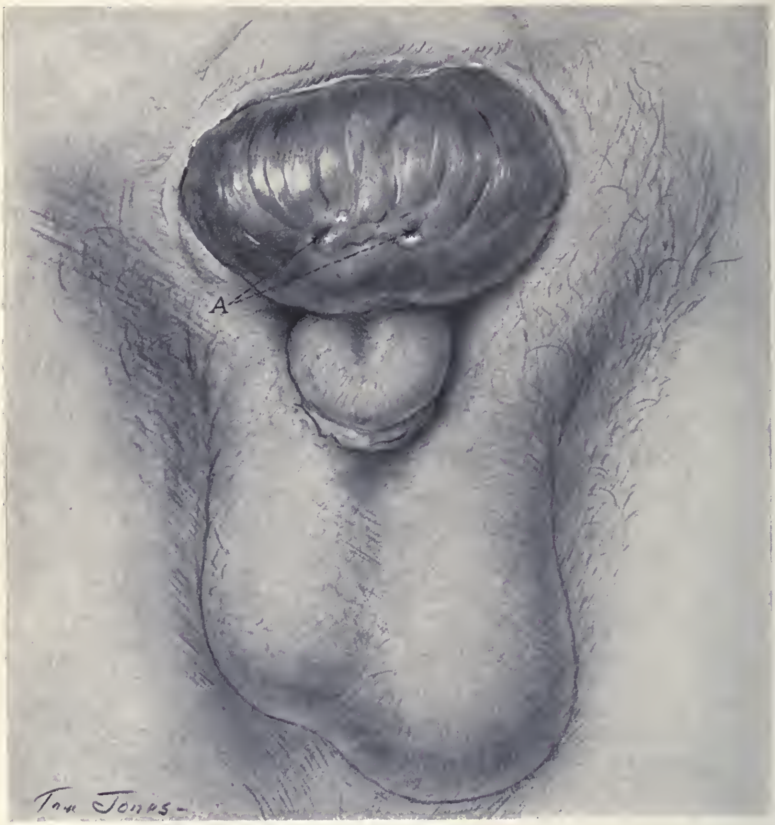

Fig. 374.—Male. Exstrophy of the bladder. Below the umbilical scar the recti muscles are widely separated; a fibrous layer between them covers in the abdominal cavity. In the pubic region, separated from the normal skin by a white line, a rounded mass, 4.5 by 6 cm., is seen; its color varies from pale rose to dark red; the surface is irregular or wrinkled; granular in patches. The parts are covered with slime, and constantly wet with odorous urine. The ureters are seen opening on the surface of this mass between mucous folds. The orifices discharge jets of urine at intervals. Symphysis pubis is absent; a fibrous band, 1.25 by 6 cm., connects the pubic bones. There is complete epispadius; a shallow groove indicates the floor of the urethra; the roof is wanting. Testicles, scrotum, and anus are normal. There is no hernia. The prostate gland is palpable.

several times proposed to the parents, was rejected for various reasons. A suicidal tendency of late prompted the desire to seek relief now (Fig. 374).

A modified Maydl operation was performed in two stages. The abdomen was opened through the left rectus muscle; the sigmoid was delivered; the bowel was divided; both ends were closed, and a lateral anastomosis was made with needle and thread between the proximal and distal segments at the lowest point possible. The plan was to use the pouch above the anastomotic opening—in the distal segment placed mediad—as a receptacle for urine. Recovery was uneventful. Ten days later catheters were placed in the ureters. An incision was made following the line between the skin and bladder mucosa; a catgut ligature was applied 2 cm. distal to the interureteric line; the mucosa and muscularis, proximal to this, was divided, and the tissue grasped with forceps; the bladder flap was dissected sufficiently loose to transplant without tension; there was considerable venous bleeding which was controlled by hot sponges and a few ligatures; the vesical flap containing the trigon was trimmed to the proper size and wrapped in gauze.

The peritoneal cavity was opened in the midline; the sigmoid colon was brought up; a curved intestinal clamp was applied to the pouch; the trigonal flap (requiring a quarter turn) was apposed to the bowel; the intestine was opened longitudinally 3.5 cm.; transplantation was made with a loop-on-mucosa suture, followed by Lembert stitches. The cavity resulting from the dissection of the bladder flap was packed loosely with plain gauze. The laporatomy wound—endeavoring to correct diastasis of muscles—was closed.

The patient returned to bed in fair condition; on the second day he was much better. He voided urine by rectum every four hours. He did not vomit or complain of renal tenderness. In short, the postoperative course was satisfactory until the seventh day, when a sudden change was noticed. He complained of precordial pain, his facial expression was anxious, breathing difficult, pulse rapid and weak, temperature elevated. His condition became steadily worse, and he died within a few hours.

A limited postmortem revealed a circumscribed peritonitis in the region of the transplantation; there was no leak; the trigonal flap and the bowel wall were of good color; the ureters were normal; the kidneys were somewhat congested; there was no pus. Venous thrombosis was apparent in the region examined.

Considering the trauma to the large veins encountered in the dissection of the exstrophied bladder and the clinical course, pulmonary embolism was probably the immediate cause of death.

Case II.—We are pleased to be able to show you this patient, for her case is unique—the first instance, according to the literature, in which the patient was a mother:

Mrs. R. was twenty-six years of age at the time of operation, now three and a half years past. She is the only member of her family to have a congenital defect. The greater part of her life has been spent in the rural districts. She has never attended school and is unable to read or write. Prior to her marriage she worked as a domestic. To obtain employment was difficult, and her stay in one place was usually brief. She has borne two children; one is living, age four years; the other died when four months old. While her condition was pitiable before she became a mother, childbearing, followed by prolapse of the uterus and vagina, added much to her woe (Fig. 375).

At the first operation the cervix was amputated and the pelvic floor repaired. Recovery was satisfactory.

At the second operation (three weeks later) catheters were inserted into the ureters. The exstrophied bladder was dissected subperitoneally to the required extent, and wrapped in gauze. The peritoneal cavity was opened. The uterus was amputated at the corporocervical junction. The ovaries and tubes were preserved. The ligaments were used in the best possible manner to anchor the stump. The sigmoid colon was delivered and an intestinal clamp applied. The bowel was incised in the long axis 3.5 cm. The bladder was brought in apposition with the colon; no tension. Anastomosis and closure of the wound were similar to that previously described. The anal sphincter was dilated and a rectal tube inserted. Following this operation there was a moderate degree of shock, from which the patient soon recovered. She voided urine by rectum every three or four hours. On the eighth day she

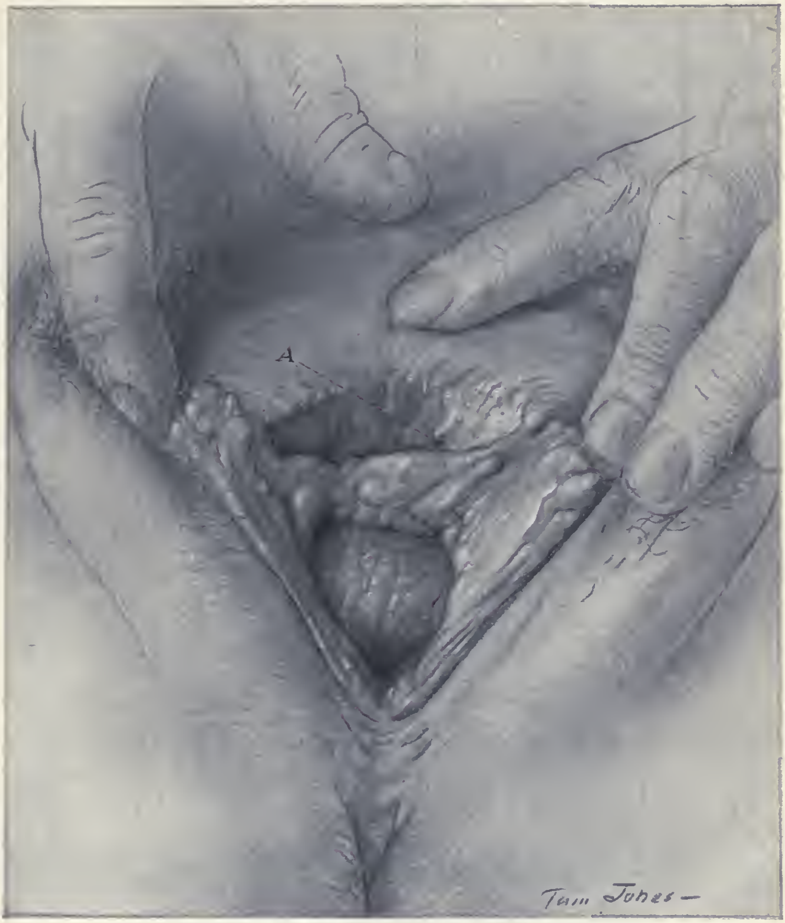

Fig. 375.—Female. Exstrophy of the bladder. Diastasis of recti muscles. Above the vagina is seen the exstrophied bladder, 4 by 6 cm., with ureteral openings, discharging urine intermittently; this trickles in sufficient quantity to keep the parts below always wet; no symphysis pubis; the pubic bones are joined by a fibrous band; cleavage of clitoris and labia minora; hypertrophy of the latter. The labia majora are sparsely covered with hair. The cervix (eroded, enlarged, and lacerated) protrudes beyond the vulvar edge. The result of injury to pelvic floor is apparent. No palpable disease of adnexa.

vomited several times. Gastric lavage was performed. The patient left the hospital in five weeks, pleased with her condition.

Urine was now retained four hours during the day, and caused little discomfort at night. It is now three and a half years since she was operated on. She is able to attend to her household duties and complains of no discomfort. General health is good. Surely the result in this case is quite satisfactory.

Case III.—By way of comparison with the modified Maydl operation this young man has kindly consented to allow me to present him, in order to show the result of attempts to form an anterior bladder wall by plastic operation:

Mr. G. P., age forty years. He differs from the two preceding cases in that he is quite intelligent, having received a grammar-school education. For this he is deserving of much credit, as we can all realize the torments and difficulties through which he passed during his school days. He has told me his story of the discomforts and trials he suffered, and yet nothing was done to alleviate his suffering until he was twenty-four years of age. At that time he placed himself under the care of a surgeon, and for one year remained in the hospital, during which time he underwent seven operations, with the result which you can plainly see. What has been accomplished? Practically nothing, except that there is a small pouch (which holds a few drams of urine), with an opening at the lower angle, from which the urine flows continually. He wears a urinal at all times and is very much inconvenienced. He desires that we do something for him, but with this immense amount of scar tissue it is questionable if operation would be advisable.

The great objection raised to the Maydl and other operations in which a portion of the intestinal tract is utilized for the urinary receptacle has been that ascending infection would occur. During the past six years in a number of dogs, after removing the major portion of the urinary bladder, we have transplanted the vesical trigon into the colon. Our early attempts were occasionally followed by fatal peritonitis or pyelonephritis. Latterly the results have been quite satisfactory, and we believe by proper technic this objection can be overcome.

The result desired in the surgical treatment of exstrophy of the bladder—a reservoir for urine under control—is best attained by the method of Maydl or a modification of this procedure.

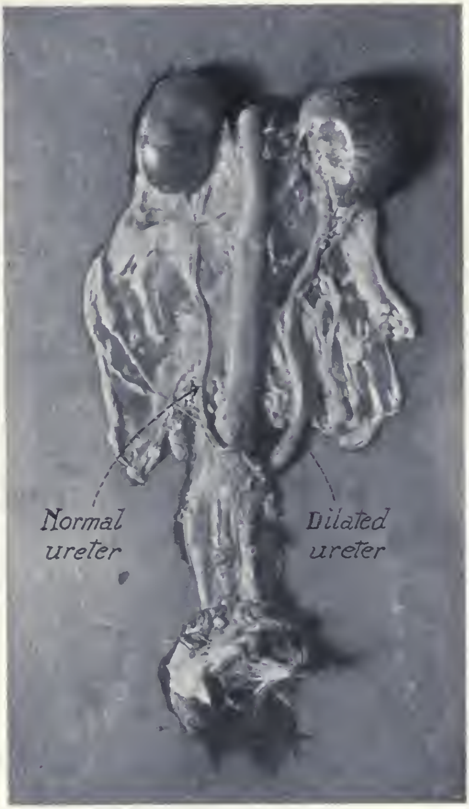

Fig. 376.—Pathologic specimen from dog. Ascending infection in a dog, terminating fatally in ten days. The left ureter is dilated and the left kidney contains pus. No changes on the right side.

My associate, Dr. J. J. Moorhead, will demonstrate some of our research work.

In the bladder work we believe that ascending infections are due principally to faulty technic. This picture of a specimen of kidneys, ureters, and transplant removed ten days following operation, in which an intentional error of technic was committed, shows how the ascending infection occurred on that side and not on the other (Fig. 376).

I will show you several dogs, with a brief description of the operative work done in each case.

Dog No. 1.—Female. On February 5, 1916, the major portion of the urinary bladder was removed, the urethra divided between ligatures, and the vesical trigon implanted by suture into the colon. Urine is now voided per rectum. No ill-effect has been noted.

This is one of a number of dogs used in our experimental work on ascending renal infection—with a similar result.

Dog No. 2.—Male. Nine months ago the jejunum was divided about 8 cm. from the duodenojejunal flexure and again sectioned 15 cm. lower; continuity of intestinal canal restored by end-to-end suture; isolated loop (mesentery intact) washed with 2 liters of sterile water and the ends closed by inverting stitches; the serosa of the loop abraded and the excluded segment of intestine attached to the inferior surface of the spleen by a few mattress sutures.

A considerable quantity of fluid distends the abdomen—a common result in animals surviving this experiment; otherwise the dog's condition is quite satisfactory.

Dog No. 3.—Male. September 4, 1917. Practically the same technic, except that the closed washed loop of intestine was attached to the inferior surface of the liver. No demonstrable amount of fluid in the peritoneal cavity. This dog has manifested no sign of illness.

In articles published recently co-workers and I showed that a closed isolated loop of the jejunum washed with sterile water and ether was compatible with life—about 67 per cent. of the animals operated upon lived indefinitely.

In these dogs (Nos. 2 and 3) the isolated closed loop—washed with water only—instead of being dropped into the peritoneal cavity was attached to the inferior surface of the liver or the spleen, with the expectation that the detoxicating function of these viscera would be called into action. What is known concerning the liver especially encouraged this hope. The connection between the bowel and the liver or the spleen should lessen the danger of perforative peritonitis. A complete report of this original work will appear later.

Dog No. 4.—Female. Ten days ago the common bile-duct and the lower or posterior pancreatic duct (the dog has two ducts) were excised from the duodenum and transplanted into the jejunum. I believe this is the first instance in which these two ducts have been transplanted successfully at one time. Four or five weeks from the date of this primary procedure the duodenum will be extirpated.

That this part of the intestinal tract is essential to life has been long believed and taught. That an animal may survive complete duodenectomy following a diversion of the biliary and pancreatic secretions into the jejunum has been the basis of considerable experimentation. The results thus far leave much to be desired.

Dog No. 5.—The entire pancreas was removed from this animal three weeks ago. The urine at present contains about 5 per cent. sugar.. The dog eats a good supply of food and drinks an abundance of water, but is extremely emaciated. Pancreatic diabetes—of which this is a demonstration—proves fatal within four or five weeks.

CLINIC OF DR. CHARLES MORGAN McKENNA

St. Joseph's Hospital

A CLINIC ON GENITO-URINARY SURGERY

Summary: Case I.—Papilloma of the bladder—treatment by excision through suprapubic route and radium.

Case II.—Kidney stone—diagnosis. Operation—correct position on the table; the muscle-splitting incision through Petit's triangle—the use of fat to prevent postoperative hemorrhage.

Case III.—Ureteral stone—diagnosis—removal through the bladder via suprapubic incision—method of draining bladder—the right-angled glass tube.

Case IV.—Acute epididymitis—palliative versus operative treatment. Technic of drainage of epididymis—importance of relieving tension on tunica vaginalis and tissues of scrotum.

Before beginning our operative work this morning I would like to show you a case operated on in this clinic four months ago. The patient, who was referred to me by Dr. L. A. Beaton, gave the following history.

CASE I.—PAPILLOMA OF BLADDER

Mr. W., fifty-two years of age. Father died at the age of eighty-one; mother seventy-seven, living and well; one brother forty-five years of age.

He had the diseases of childhood. Married twenty-eight years. Has three children living and well.

He never complained of any illness until six months ago, at which time he noticed a few drops of blood in his urine, and a few days later a little more blood was noticed on finishing urination. He consulted a physician, who gave him some medicine. About two weeks later he had a considerable hemorrhage from the bladder, at which time he was referred to a physician who gave him fulguration treatment three times over a period of two and a half months. A week ago he had some hemorrhage.

The patient was put to sleep with gas-ether anesthetic. On opening the bladder a large papilloma could be easily recognized on the left side of the bladder, involving the left ureteral opening. The diameter of the upper surface was about 1¾ inches. The pedicle was about ½ to ¾ inch in diameter. The evidence of the fulguration could be seen about the base and a little toward the upper surface. It was evident that the tumor could not be removed without injuring the ureter on this side.

An incision was made directly over the ureter on that side of the bladder, about 1½ inches away from the base of the tumor. The bladder was carefully dissected and the tumor mass removed. The ureter was incised about ½ inch away from its orifice. Chromicized catgut was introduced into the distal end of the ureter, which was used for transplantation later on in the operation. The transplantation was easily made in the upper angle of the bladder incision. The bladder was closed in the ordinary way and a fairly stiff rubber tube, ½ inch in diameter, connected with a right-angled glass tube, was used for drainage. The tube was placed at the upper angle of the skin incision.

The wound healed with primary union up to the tube. The drainage was removed on the fifth day, when radium was introduced by means of a lighted cystoscope. It was easy to introduce the radium into the deepest part of the incision by this means. The radium was allowed to remain in the bladder seventeen and one-half hours, when it was removed by the nurse.

I would like to mention here that it is impossible to do good bladder and kidney surgery without having a well-trained and experienced nurse. By an "experienced nurse" I mean one who is familiar with the handling of this class of cases. When the nurse is not especially interested in the outcome of the case the patient never does well. I cannot say too much about the after-care of bladder cases. They need special care, and the first four or five days usually determines the outcome of the patient. This is very noticeably true in prostatic work. These patients, you know, are all old people. They have had considerable shock from the operation, and a wet, bad-smelling dressing over the abdomen is very objectionable to the patient, and if he is in a ward, complaints from other patients often arise. I have made it a practice for some time to have the same nurse, and whatever else you do, *take care of the after-dressings yourself.* No one is more interested in the outcome of the case than the operator, and to get good results it is most necessary that the operator or at least a very closely associated assistant look after these cases once or twice a day.

You can see from observation that this man is very well nourished. He complains of no trouble on urination and has no blood in his urine. He has gained 21 pounds in weight, 2 pounds more than he has ever weighed in his life. He is not troubled in getting up at night and suffers no pain. We will cystoscope him now and see the condition of the bladder.

You notice that the patient tolerates about the normal amount of fluid in the bladder without discomfort. The right side is perfectly normal. The left side, where the dissection was made, is perfectly healed, but somewhat red. The urine can be seen coming from the left ureter. On the whole, I think the bladder looks exceedingly well.

CASE II.—KIDNEY STONE

The first case we will operate this morning is a large silent stone in the left kidney. This patient was referred to me by Dr. L. A. Beaton. I will ask the intern to read the history.

History.—W. E., twenty-two years of age. Mother living and well. Father died six months ago from apoplexy. Two sisters and one brother living and well. One sister was operated on two years ago for stone in the right kidney.

The patient says that he passed a stone through the urethra about four years ago and has not had much pain since. One week ago he had a sharp pain in the region of the left kidney, which radiated toward the left leg and down the left groin and leg. He passed a few drops of blood. He has had no pain since that time.

Dr. McKenna: Three days ago a cystoscopic examination was made and the bladder looked normal. The ureteral orifice also appeared normal. A shadowgraph catheter was introduced and an *x*-ray picture made. A large silent stone can be seen in the picture. The stone fills the entire pelvis of the kidney and has some projections down into the ureter. The calices of the kidney are fairly well outlined and may contain part of the stone, although Dr. Trostler, the *x*-ray man, is inclined to believe that the kidney is filled with a number of small stones. We will bear that in mind until the kidney is opened.

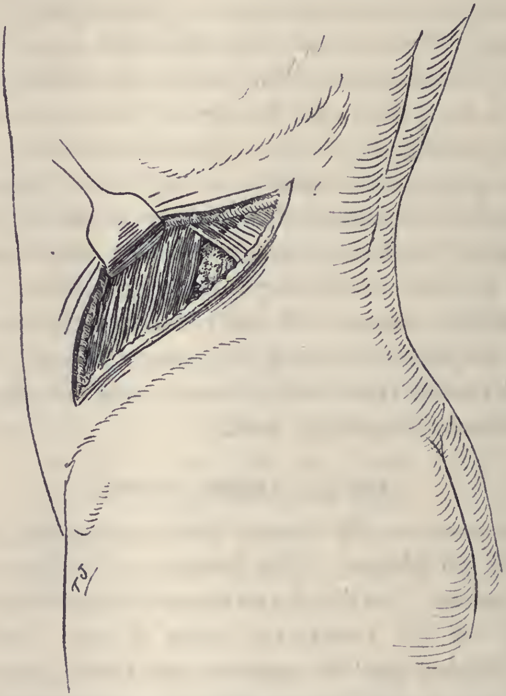

Fig. 377.—Oblique lumbar incision exposing Petit's triangle and muscle borders, the separation of which characterizes the approach to the kidney used in this case.

In bringing in this case you will observe that the patient is in perfect position to have the operation made. He is on the right side with specially made shoulder braces to keep that part of the body in position. The center of the table is well elevated, so that the left side on which we are to work is well in view. I think it necessary to have these details worked out, because it saves so much time in the turning and handling of the patient after he is asleep. The table is so constructed that these straps hold the legs in position, so that it is a much better table to work on than a flat one requiring a number of sandbags to hold the patient in position.

The incision is made parallel to and midway between the last rib and the rim of the pelvis. We have exposed the muscles so far without using an artery clamp (Fig. 377). I am going to divide Petit's triangle. By doing this there is but little hemorrhage, and you will see the ease with which the kidney can be palpated. We will have to elongate the triangle in both directions. We are now down to the perirenal fat. This is always split completely so as to make delivery easy. I preserve the fat, as it can be used to considerable advantage later on in the operation. With a piece of dry gauze I can readily separate the fat of the upper pole from the kidney (Fig. 378), but the lower pole seems to have quite a number of adhesions. These will gradually come off, I believe, by just taking a little time and making a slow dissection (Fig. 379). It pays to spend some time when adhesions are present, because the kidney can be delivered so much easier afterward. On putting my hand in the cortex of the kidney the stone can be easily felt. It seems to fill the entire pelvis and parenchyma. I think it is the largest stone I have ever felt in a kidney. Great care must be exercised in delivering the kidney or else the stone will break through the parenchyma, thereby destroying the kidney substance and leaving small particles of the stone in the kidney, which will only serve as a nucleus for other stones. By cutting down on the stone through the parenchyma we will have space enough to enucleate the projections of the stone out of the calices. You notice we have exposed the body of the stone with the edges still intact, which can be easily removed through this incision. Each calix is filled and a projection of the stone about ½ inch in length is in the ureter. We will have the specimen measured and weighed (Fig. 380).

In closing the kidney we will make use of the fatty capsule.

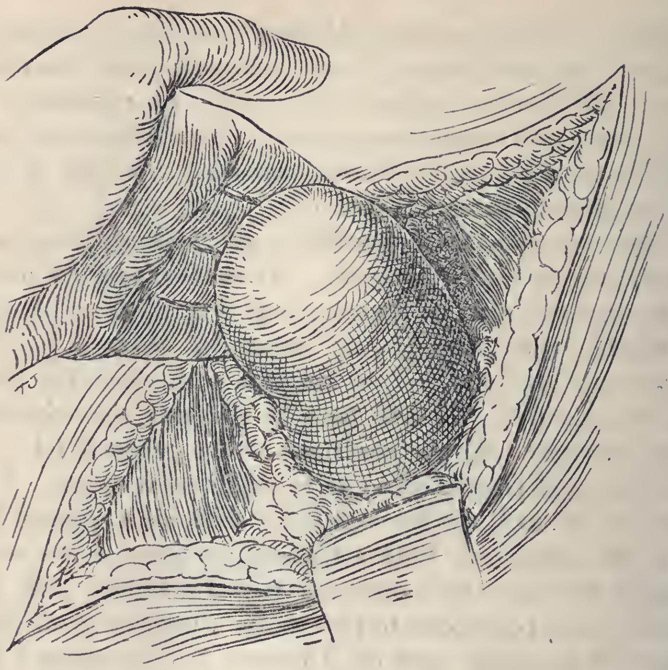

Fig. 378.

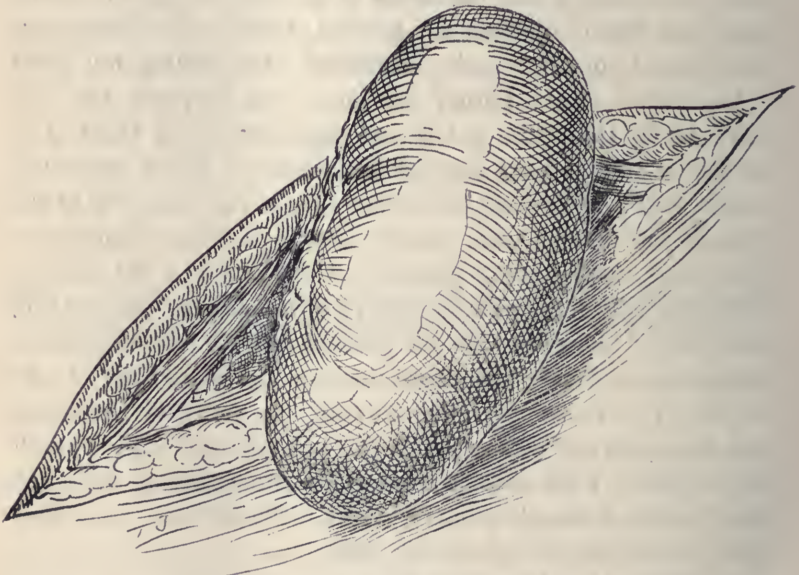

Fig. 379.

Figs. 378 and 379.—Separation of fatty capsule and delivery of kidney.

A layer of fat is placed in the incision of the kidney. A suture is put through the kidney wall and also the fat. I might mention here that neither the patient nor his family would consent to having the kidney removed. Since the upper pole is in good condition the kidney is allowed to remain. The one thing that we must consider is postoperative hemorrhage. Fat inserted as it is here serves as a natural packing and will prevent hemorrhage. It is not uncommon to have this class of cases suffer from severe hemorrhage after the operation. This may occur at any time from the day of operation to three or four weeks after. I had one experience of a severe hemorrhage three and a half weeks after operation. The patient had gone home apparently recovered from the operation when taken with this terrific hemorrhage. She was immediately brought to the hospital and the kidney removed. In that case no fat had been used to arrest hemorrhage and the infection around the stone present at the time of operation had continued until enough necrosis had taken place to produce the hemorrhage.

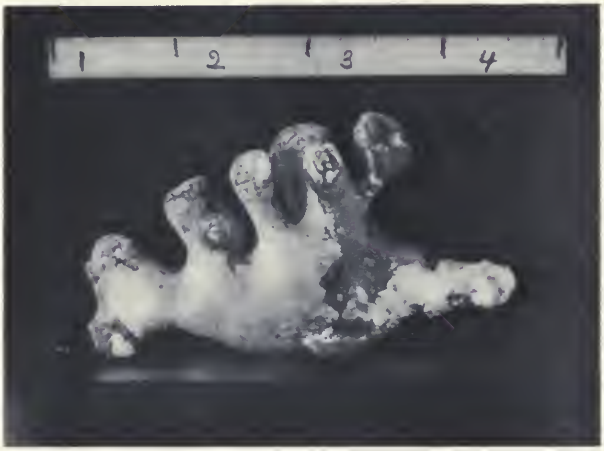

Fig. 380.—Specimen removed; it filled entire renal pelvis with projections into calices.

In this case today three sutures are all that are necessary to close the kidney. The fatty capsule is brought up over the kidney and a cigarette drain placed down to the parenchyma. We will now close the muscles; three or four sutures are plenty for this purpose (Fig. 381). I remember a few years ago twenty or thirty sutures were used for closing, but at that time the muscle-cutting operation was used. I cannot place too much emphasis on the advantage of the muscle-splitting incision which we now use. It makes the work so simple and the patient feels perfectly comfortable afterward. The patient will not favor this side, and at the time he leaves the hospital will walk naturally. The drain will be removed in twenty-four hours and after that no other dressings are necessary.

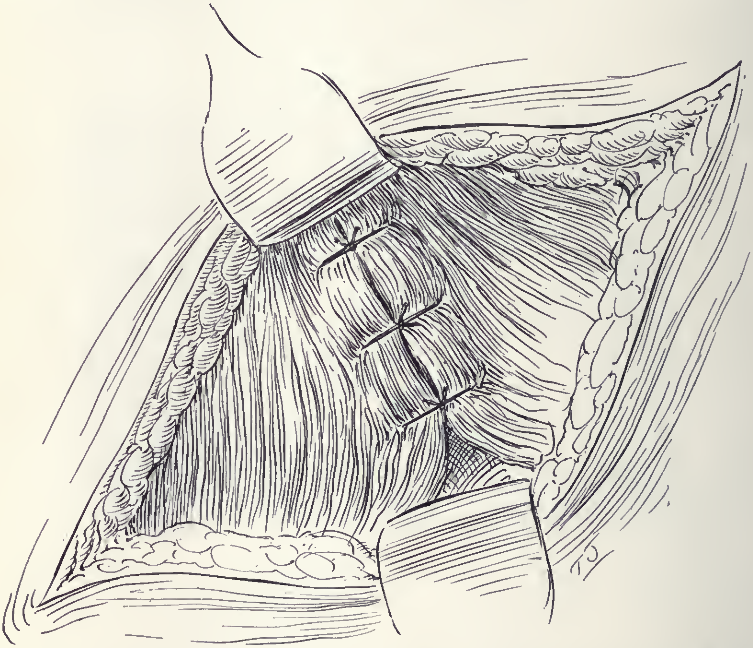

Fig. 381.—Closure of muscle-splitting incision. Note small number of sutures required.

CASE III.—URETERAL STONE—*Referred by* DR. W. BURMEISTER

I will have the history of this case read.

History.—Mr. J. R., forty-two years of age, admitted to hospital seven days ago. Father died of softening of the brain.

Mother still living. Two brothers living and well. One sister alive. Five children in family dead.

Past History.—Had bladder trouble since a child. Urinations very frequent, with continuous pain on left side. This pain is dragging in character, intermittent, and recurs about once or twice a month. Some pain experienced on urination. Had an operation two years ago for papilloma of the bladder. Had another operation one year ago for growth in the bladder. Still continues to have pain on the left side and has had no relief from the operations.

Present Complaint.—Two weeks ago the pain started in the left groin, radiating through to the left kidney. The pain is dull and aching in character, continuous, increasing in severity on coughing and upon urination. There was some burning pain in the urethra during urination. The patient must get up five to six times nightly and urinates often during the day.

Urinalysis shows blood and pus. Skiagraph shows a light shadow about $1\frac{3}{4}$ inches above the bladder. We have had a number of pictures made and the same shadow is produced.

On cystoscopy the right ureter is normal, but the left ureteral orifice and bladder wall are much pouched into the bladder. Scar tissue can be easily recognized on this side. The corresponding side is very much reddened and inflamed. On catheterization the right kidney shows normal urine, while on the left side the catheter can only be introduced about $\frac{3}{4}$ inch and a wax-tipped bougie shows an indentation on the catheter tip.

Functional test was not done on this case, as the diagnosis is complete without it.

Operation.—We will go about this case in the same way as we do in a suprapubic prostatectomy. The bladder, as you notice, is well filled with water for distention. This brings the bladder well up in the perivesical space and will make it much more easy to expose the bladder and push the peritoneum up. We will now make a median incision and expose the bladder through Retzius' space. You will note that we spend some time pushing the peritoneum back from the bladder wall, and we also spend some time cleaning the fat off the bladder wall before opening. This is done so that a better cleavage can be obtained on the margin of the bladder when suturing the bladder together again. It also does away with necrosis of fat tissue and sloughing in the repair.

The bladder wall is now opened with a fine bistoury and a dry lap sponge is placed over the opening, while the assistant releases the catheter, which is still in the bladder, through the urethra. This allows the water from the bladder to flow off into a basin and keeps the abdomen perfectly dry and the field clean. The bladder opening is made a little longer so as to expose the trigon. I now illuminate the bladder with an electric light. This electric lamp has been sterilized and can be used to good advantage in the bladder cavity. The left ureteral orifice is very much dilated and pus is jetting from it in about the same way urine does. This shows that the kidney is functionating on that side. We can see the scar of the previous operation in the bladder wall. I now introduce a curved probe into the ureter to see if there is a stone present. You notice how the pus flows out after the probe has been introduced. There seems to be a large abscess in the ureter. I can easily feel the stone with the probe. We will enlarge the ureteral orifice and try and remove the stone with a curved forceps made for that purpose. The stone seems to be conical in shape. It seems like a very

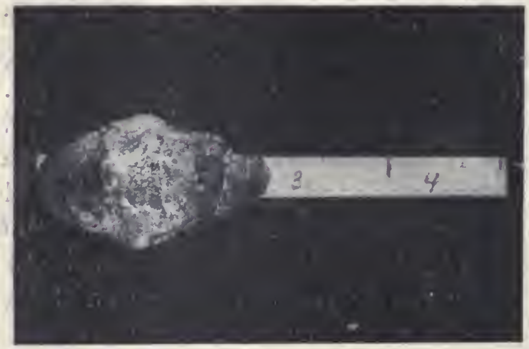

Fig. 382.—Ureteral stone removed through the bladder.

large stone. I have no trouble in getting the forceps on the stone, but it is so enclosed in the cavity that it is difficult to remove it without destroying the bladder wall. I can bring it to the edge of the orifice. Now give me a long forceps so that I may get a better grip. You notice that with this forceps the stone does not slip away from our grasp. This stone is at least 1½ inches long and ¾ inch in diameter (Fig. 382). It is conical at both ends. I would like to have the doctors observe the continuous flow of pus which follows the removal of this stone. It will be interesting to see how this man's kidney functionates afterward. We will follow this case closely and report its progress from time to time. By means of repeated functional tests we will compare this left kidney with the right.

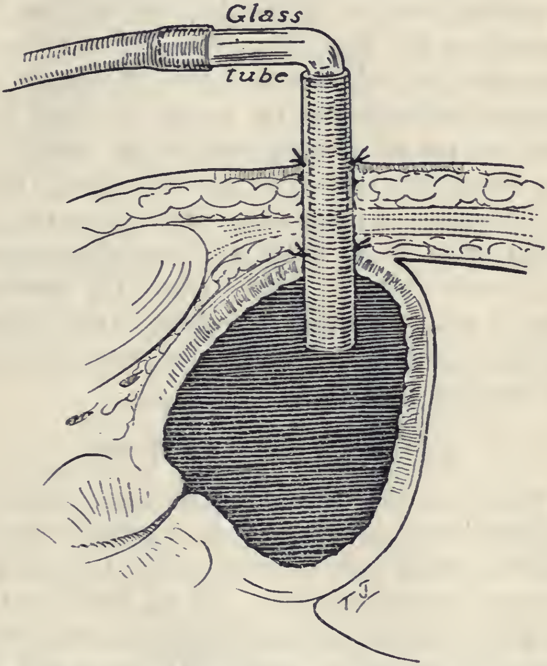

Fig. 383.—Method of draining bladder by right-angled glass tube.

I will now place two sutures in the bladder wall and introduce a rubber drain into the ureteral orifice and drain through the perivesical space. You notice in suturing the bladder that we run a double row of sutures from the lower margin of our incision up to the top. This is done to make the bladder wall water-tight. We will suture each layer up to the skin very closely so there will be no remaining spaces. In this way primary union is easily obtained, and the patient has no more discomfort from the drain than he would in any other abdominal case. We now introduce a glass tube bent at a right angle into the rubber tube in the bladder, carrying the tube well down underneath the skin (Fig. 383). Much harm is often done when the glass tube is not carried far enough below the skin, because the glass inside the rubber will bend the rubber upon itself and cut off the flow into the jar outside. In this way the drainage from the bladder is forced through the stitches and a general infection takes place, which keeps the patient in the hospital much longer under the most disagreeable conditions and retards union for some weeks. We therefore spend much time in seeing that perfect drainage is established, which not only helps the patient but also does away with much attention in the after-treatment.

CASE IV.—ACUTE EPIDIDYMITIS

This man has been suffering with an acute epididymitis for the past three days. The doctor in attendance has used all the palliative means without success, and the young man is complaining of excruciating pain. In an article written some time ago I said that all acute epididymites were divided into two classes—severe and non-severe. The non-severe will yield to palliative treatment, such as the different kinds of salts, elevation, etc., while in the severe cases surgical procedure is always necessary. You notice that this man's scrotum is very much swollen and red and the testicle is very tender on pressure. I would like to say before operating on this case that we will find that this man has not only an inflammation of the epididymis, but also a beginning hydrocele.

The patient will now be put to sleep and an anterior incision made in the right side of the scrotum. The patient goes to sleep very readily, as you see, under gas, and the operation will be continued with an ether anesthetic. As I make the incision through the different layers it sounds a great deal as though I were cutting leather under tension. This tension has been causing most of his pain. We are now down to the tunica vaginalis. It is markedly hyperemic. We will make the incision in the tunica just the same as though we were doing a hydrocele. There is about an ounce of fluid around the testicle. Now we will expose the globus minor. The epididymis is very much swollen. By taking this straight, sharp bistoury and making a small incision in the globus minor a few drops of pus can be expressed (Fig. 384, 1). Yes, I would say there are about 5 or 6 drops in this case. We will now introduce a small gutta-percha drain in the lower pole (Fig. 384, 2), and the operation will be finished in the same way that a hydrocele operation is done and will do away with any fear of a hydrocele returning to this patient (Fig. 384, 3).

A point that I would like to make clear to you gentlemen is this, that the incision for acute epididymitis is always made on the side of the scrotum opposite to the epididymis. This is done because of the great amount of pressure from the fluid around the testicle and the great tension of the various layers of fascia between the tunica vaginalis and the skin. I tried some years ago making a small incision into the epididymis and inserting a drain. The result was very successful as far as removal of the pus was concerned, but the patient was not entirely relieved of the pain. We find that the patient suffers as much pain if not more from the tension of the various layers of fascia with fluid in the tunica than he does from the epididymitis itself. This, of course, is due to the infection coming directly from the epididymis through the rete testis proper into the testicle, thus producing an orchitis. I mention this particularly because in this case the patient will be entirely relieved of pain on awakening and will have no more suffering. The drain will be removed within twenty-four hours and the patient discharged on the second day.

I believe if this operation were carried out more frequently

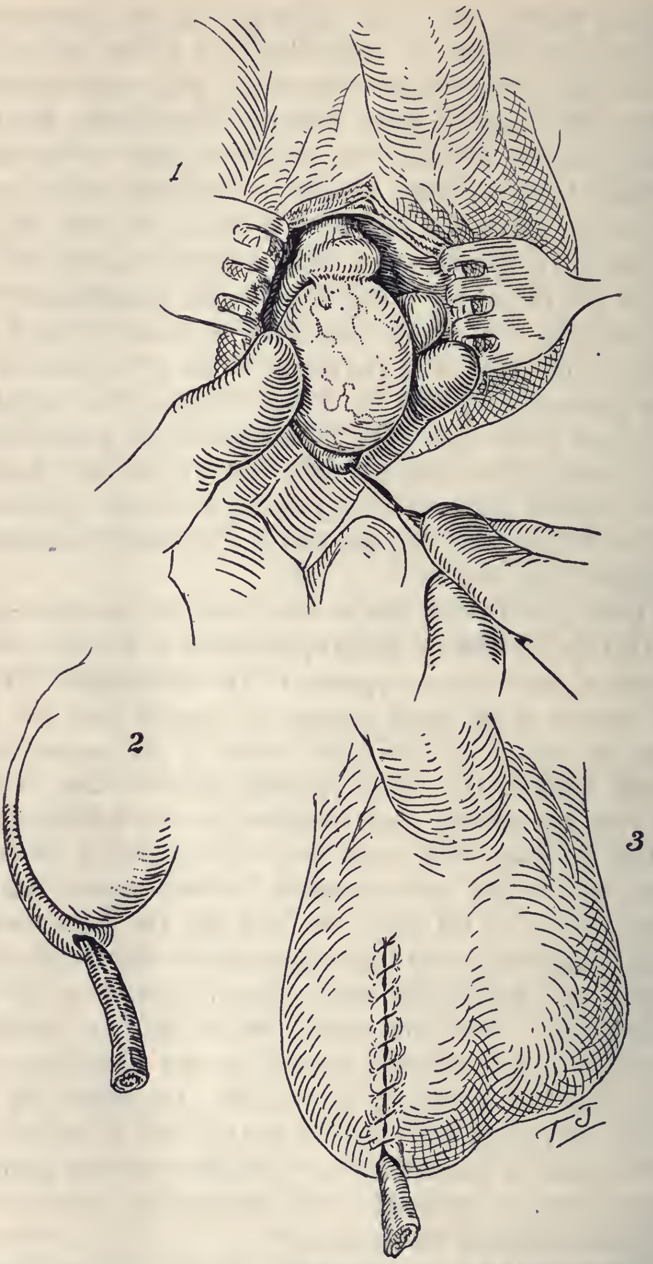

Fig. 384.—1. Exposure of testicle and incision in globus minor of epididymis. 2. Gutta-percha drain in place. 3. The operation is completed.

that we would have fewer cases of sterility. You know where suppuration is allowed to go on from day to day the patient not only suffers severe pain, but an occlusion or blocking takes place in the globus minor, thus producing permanent sterility. I have had occasion to do a number of short circuitings of the vas deferens with the epididymis in order to produce fertility. This has been done with some degree of success, but it is difficult at times to find a field in the epididymis where you get free living spermatozoa.

CLINIC OF DR. THOMAS J. WATKINS

St. Luke's Hospital

PRESENTATION OF PATIENTS TREATED BY RADIUM FOR HEMORRHAGES DUE TO BENIGN CAUSES

Summary: Radium a specific cure for hemorrhage at the menopause; with certain exceptions it is not suitable for treatment of fibroids—necessity of further experience.

July 19, 1918.

I WILL present brief reports of cases and then make comments on the use of radium for hemorrhage from the uterus due to benign causes.

Mrs. B., aged forty-nine, has been bleeding for the last year each month for ten or twelve days. Otherwise well. Examination shows uterus retroflexed, about twice as large as normal, with a small fibroid in the left horn.

On March 20, 1917, 50 mg. of radium were inserted into the uterine cavity and left for twenty-four hours. Very little constitutional disturbance resulted from its use. For the following two months she had scant menstruations; none since.

Examination now shows uterus senile in size and no tumor palpable; no menstrual discharge for fourteen months. A cure has resulted. The radium apparently saved her from hysterectomy.

Mrs. W. C. B., aged forty-four at time of examination, had been flowing profusely for one year. Hemorrhage at times lasted from thirty to forty days. She was otherwise well except that she was anemic.

Examination showed a uterus about one and a half times normal size. Diagnosis was menopause hemorrhage due to disturbances of the ductless glands.

November 9, 1916, treated with 50 mg. of radium for twenty-four hours. Very little constitutional disturbance resulted.

One moderate menstruation on the following month and none since. The patient is cured.

Mrs. B. C., aged thirty-seven, had a right oöphorectomy and double salpingectomy three years ago. Curetage for hemorrhage November 19, 1917. Some improvement followed curetment.

Examination showed uterus normal in size and position, with a large cystocele and rectocele.

January 4, 1918, exploratory curetage and "advancement operation" for cystocele and perineorrhaphy. Insertion of 50 mg. of radium for twenty-four hours. There was considerable bleeding for two months following the use of the radium. Since then she has had amenorrhea. Diagnosis was metritis resulting from an old infection. Without radium she would have required a hysterectomy.

Mrs. F. C., aged forty-two, was cureted one year ago for hemorrhages. Has had excessive menstruations for four years.

Examination showed a slightly enlarged uterus, otherwise negative. Diagnosis: hemorrhage of the menopause.

February 19, 1917, radium treatment—50 mg. for twenty-three hours. Had one menstruation the following month which lasted for two or three days. Since then there has been no flow and the uterus has become senile in size.

Mrs. A. D., aged thirty-eight, first seen April 29, 1918. Two years previously had a myomectomy. Since operation has bled almost continuously, at times profusely. Has become very anemic.

Uterus is very slightly enlarged and probably contains some small fibroids, but none are palpable.

April 29, 1918, treated by 50 mg. of radium for twenty-four hours. There was a large amount of bleeding, which was fairly constant for two months following the treatment. Since then there has been no bleeding and she seems to be cured. Although the radium has probably made it unnecessary to do a hysterectomy, the amount of disturbance and inconvenience resulting from the hemorrhage suggests that a hysterectomy would have been preferable to the use of radium in her case.

Miss L. E. M., aged forty, uterine fibroid size of a three months' pregnancy. Hemorrhages.

Treatment, 50 mg. of radium for twenty-four hours on December 31, 1917. There has been one scant menstruation since. The uterus is about normal size. There is very little disturbance except for hot flashes. There are one or two small fibroids, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, to be felt in the anterior wall of the uterus.

Mrs. N., aged forty-one, hemorrhage at menopause. This patient had received three series of *x*-ray treatments for hemorrhages, with little or no relief.

May 11, 1917, treated by 50 mg. of radium for twenty-four hours. She has had no bleeding since and is cured.

COMMENTS

These cases, which are selected at random, indicate that radium is a specific treatment for hemorrhage at the menopause. One can, with almost complete certainty, expect a cure with one treatment. With proper screening there is no danger from 1200 mg. hours of radium in the uterine cavity. In our experience the chief constitutional disturbance is nausea and vomiting, and this is often considerable following the radium insertion. It almost invariably disappears upon removal of the radium.

The screening generally used is 1 mm. of brass covered by thick rubber. We have used platinum and gold, but find no advantage in their use, except the screen need not be quite as thick and, consequently, does not require as much dilatation for insertion. A gas anesthesia is generally necessary for dilatation and exploratory curetage.

The dangers from infection should be considered about negative. We, however, had one instance where the patient after returning home developed a pelvic peritonitis, which resulted in an abscess. This, in all probabliity, was due to a latent infection in the fallopian tubes.

In cases of fibroid: radium is well adapted to the treatment of small fibroids in women near the menopause. In younger women it is better to remove the tumor than to destroy the function of the ovaries by radium. In large tumors the dangers of a mistaken diagnosis, of malignancy, and of intraperitoneal complications make them poor cases for radium. Radium is also not well adapted for submucous or subperitoneal fibroids. The amount of bleeding which results occasionally from fibroids after the use of radium is a decided objection to it. The amount of bleeding is sometimes so much as to disturb the patient more than does the usual hysterectomy.

It is necessary to have further experience with the use of radium in fibroids before definite statements can be made relative to its indications in the treatment of fibroids.

CLINIC OF DR. CHARLES B. REED

WESLEY MEMORIAL HOSPITAL

AN OBSTETRIC CLINIC: PRESENTATION OF 2 CASES

Summary: Argument for the induction of labor at term—the common objections not well founded; methods of estimating size and weight of the unborn child; the Voorhees bag—technic of its use—its superiority to the catheter and the pack; the place of pituitrin—its dosage and uses; a case for cesarean section—the indications—the technic—advantages of delivering the uterus before incising it.

June 10, 1918.

The first case to which I want to call your attention is rather unorthodox and, consequently, is entitled to more discussion than usual.

The induction of labor at term is comparatively new, and the question that at once comes up in your minds is, Why should we induce labor at term? The reasons for inducing labor at term are four, and any one of them, in my opinion, is a sufficient warrant for the operation. The first reason is that the child is mature at term, while the onset of labor is always accidental. Now it is no more justifiable to leave the child to fall by accident than it is to leave ripe apples on the tree instead of plucking them. We do not leave an apple to the chance of impairment or to the injury that occurs when accidentally dislodged, neither should we abandon the child to a similar fate.

Second, the child should not be allowed to become postmature. Why not? Because the child puts on fat in the uterus just as an adult puts on fat after he reaches maturity. Fat is a degenerative change. Fat is a sign of greater intake than the system has demand for. The child puts on weight at the rate of $\frac{3}{4}$ pound a week after maturity. It grows only at the rate of $\frac{3}{4}$ cm. a week during the same period of time. This means that the child will probably put on 3 or 4 pounds before the accidental onset of labor. What is the result? It means that an unusually large child is driven by unnecessarily severe pains through a poorly dilated passage and one that is extremely hard to dilate. It means that the child will perish in many cases as a consequence of the severity of labor. It means that the mother will sometimes perish, that she often will be badly mutilated, and that she will in all cases be exhausted and her convalescence will be lengthened by the protracted character of her labor. Therefore we do not and should not allow the child to become overmature.

Third, it shortens the duration of the labor. We have demonstrated clearly in our work at Wesley that the average duration of all induced labors, whether primiparæ or multiparæ, is seven and a half hours. This is a gain of from six to ten hours in the duration of labor, a very vital point when we consider the danger to the child in long labors and the dangers of maternal exhaustion. The first stage is shortened from four to six hours; the second stage, from a few minutes to several hours, depending upon the case.

Fourth, it is a matter of convenience. Now that seems irrational. Why should we induce labor as a matter of convenience? Because, as Adam Wright of Toronto said, in defense of induction of labor, "If it is less harmful to interrupt labor than to allow labor to go on, then we are certainly justified in seeing that labor is begun." To the woman who is working, and who is compelled to give up her work at an uncertain time and go to the hospital, it is a matter of economic importance. To the woman who is not working and who must engage her nurse at a certain date, it is a matter of importance to know when the nurse should be engaged. To the hospital it is a matter of expense to know whether a woman will remain in the house for six hours, six days, or six weeks. To the doctor it is a matter of prime importance to know that on a certain day his case will deliver, to know that on a day appointed and in the morning his patient will go into labor and to arrange so that he has nothing else to do on that occasion but take care of her from morning to night. She passes through a safe delivery at the close of the day and he has not been interrupted by other calls. The woman has had his care and attention all day. All these things—the patient, nurse, hospital, and doctor—are benefited, as you can readily conceive from your experience, by knowing exactly when labor will begin and ordinarily, within a variable period of about two hours, we can say when the labor will end, so that any one of these reasons is, in my opinion, a justifiable indication for the induction of labor at term.

Now in your own minds you have been quietly raising objections, and there are objections. The objection that we hear most frequently and the objection that comes to us from the laity and from medical men alike is that the process is contrary to nature. It is contrary to nature because nature is careless and indifferent. Irrigation is contrary to nature, but it is more felicitous than rain. Is not the opening of an appendiceal abscess also contrary to nature? The abscess will open in time if left alone. True, but it may open into the peritoneal cavity, into the colon, or into the rectum, but why leave it to do so? The progressive doctor will open that abscess at once and avoid all the accidents that come when nature takes charge of the case. That same man who is careful in the matter of the appendiceal abscess often refuses to accept the doctrine of induction of labor at term. He evades his responsibility.

Another objection has been raised, which to us was very important and caused us much anxiety, and that is the danger of infection, which, of course, comes into the minds of all of us. The danger of infection was at first the most vital menace that we felt. What are the chances of infection? If I preface my remarks by saying that we have had no infections, that we have had no temperature of more than 100° F. in something like 250 cases wherein we have induced labor, except where it could be accounted for by breast conditions or other glandular involvement, and of these only a few, then you will understand that this has become more or less of a stationary issue with us. Infection, we believe, is theoretic rather than real as an objection. Why? Because the woman's labor is so short that her resistance is unimpaired. She comes out of labor in an average period of seven and a half hours, and her tissues are in condition to resist all kinds of infectious agents. In our first cases we religiously made smears of the cervix and of the vaginal surfaces in every case and we found streptococci, staphylococci, gonococci, and other germs, and we went ahead just the same, though with fear and trembling. We got no temperature because, as we believe, the shortness of labor makes the woman resistant to infectious organisms. If these same women had had protracted labors, whether induced or not, it is highly probable that the puerperium would be complicated by a temperature—at least in some cases.

Another objection was the danger of prematurity. All of us have been taught and believed that while we could measure the pelvic brim to advantage, we could not measure the child. Now we know that we *can* measure the child, and in all cases we *do* measure the child, and in *all* cases we know the exact length of the child, the probable weight, and probable biparietal dimensions. We presume a child born at term to be from 49 to 51 cm. in length, that it weighs approximately 7½ pounds, and that the biparietal diameter is 9½ cm. We can get the measurements which give us these dimensions with the utmost ease and certainty. By Ahlfeld's method we measure from the breech of the child to the upper border of the symphysis, deduct 2 for the thickness of the abdominal wall, and multiply by 2 to allow for the extension of the body. In 100 cases that we have examined the largest error made was 2 cm. Usually we come within ½ cm. of knowing the length of the child, which is approximate enough.

Second, we use McDonald's method of measuring the uterus. By putting one end of the tape on the symphysis and the other end at the height of the fundus of the uterus, we are able to get our estimate. We usually get 35 cm. Spiegelberg and Varnier have maintained 33 cm. to be the normal height of the uterus at term, but for our purpose 35 cm. is safer. We have found that the height of the uterus at term will vary from 33 to 35 cm. Then there is Perret's method of estimating the biparietal diameter. We take, with the calipers, the occipitofrontal measurement of the head, and by a series of deductions which we have carefully worked out, varying from 1½ to 2½ cm., we come within ¼ cm. of the biparietal diameter. Now when we realize that the biparietal diameter can come through the pelvic brim when it is at least one-half and sometimes a full centimeter larger than our calculated measurements, then we can be sure that we have measured approximately enough the size of the fetal head. All of this has a bearing on the maturity of the child. We do not induce labor on premature babies. We know that mature babies weigh between 6 and 8 pounds and therefore we can assume that of all babies that are born weighing more than 8½ pounds, 71 per cent. are postmature, as v. Winckel has shown; 71 per cent. have gone overtime; 71 per cent. have clung to the mother until overfat, until fatty degeneration has set in. It is a sign of postmaturity and beginning degeneration that should not be awaited.

We have found, then, as objections: (1) contrary to nature, (2) danger of infection, (3) danger of a premature child, and now (4) the possible dislocation of the presenting fetal parts. This objection is more theoretic than real. In our experience we have not been able intentionally or otherwise to bring about a change in the presenting part by the ordinary use of the bag. The head seems to follow the same rules when the bag goes down as those which determine its position in the first place. It follows the bag down in exactly the same way in which it enters the pelvis without the bag. We have tried on several occasions to convert an occipitoposterior position into an occipito-anterior position when the bag has been in place. In only one instance that I know of did one of our prominent obstetricians succeed in changing the position of the head. In this case he carried the bag in and produced a face position out of what was a normal occipito-anterior one. I have always believed he was trying to insert the bag into the fundus instead of into the cervix because I cannot understand how a bag inserted in the cervix with even moderate skill could bring about such a radical change in the position of the head.

Now a word as to the technic. We use in nearly all our cases the Voorhees bag No. 4, which is, as you see, a flat-topped fabric bag. With the old elastic bag of Carl Brown the ease with which the head could be dislocated was considerable. With this bag, which is inelastic and flat-topped, it is not possible to dislocate the head. In arranging for the insertion of the bag we pull out the end of the bag and then roll it up like a cigarette as firmly as possible. We have, as a consequence, a cylinder-shaped structure which has a hard, sharp, cone-shaped point of resistance in front. Ordinarily such a bag will be carried into the cervix without any great difficulty. The bag is seized with a pair of Pean forceps and is introduced ordinarily without the use of dilatation or chloroform. It is carried readily into the cervix and up—if necessary—beside the head, be-

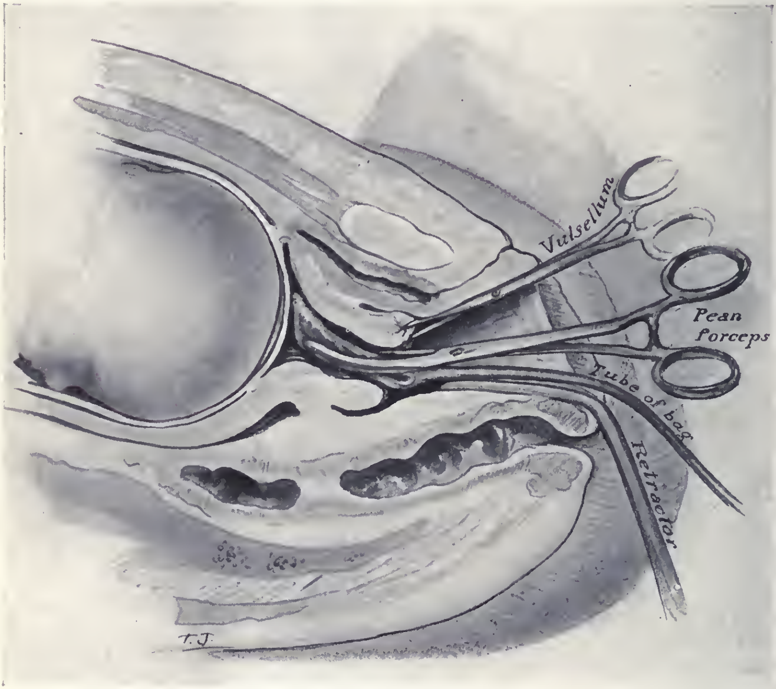

Fig. 385.—Technic of introduction of Voorhees' bag.

tween the membranes and the uterus (Figs. 385 and 386). In the operations which we have done we find about 3 cases out of 100 where an anesthetic is required. That means that the great majority of these cases are affected rather by nervousness than by the pain of introduction.

Case I.—Now you see the speculum is introduced as gently as possible. The upper edge of the cervix is seized with a double-tooth tenaculum and pulled down. The finger is introduced to assure us, as far as possible, of the location of the os. Ordinarily the bag goes in with considerable ease, but there is resistance on the part of this patient due to nervousness. It is an error in technic to rupture the membranes and it would not have occurred in this case were it not for the restlessness of the patient. We rupture the membranes in possibly 2 cases out of 100. The Pean forceps are now unlocked and

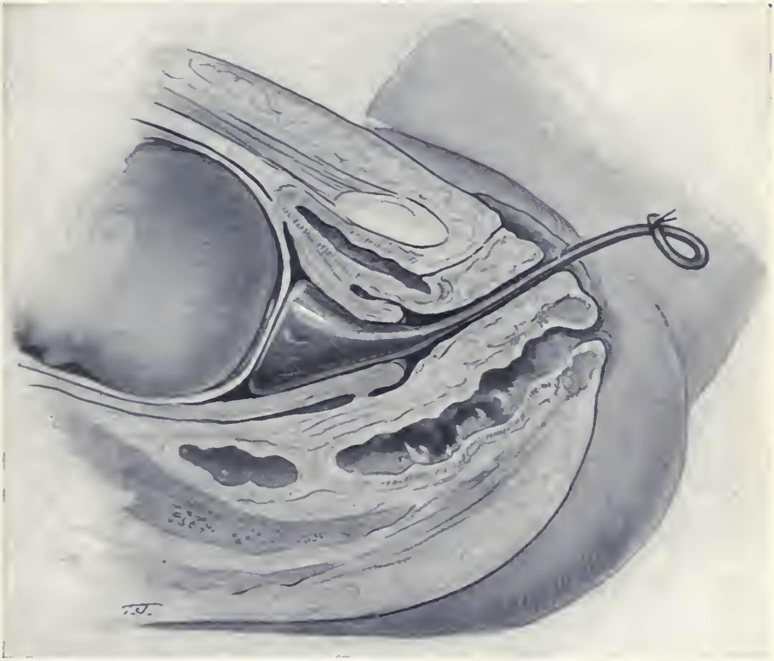

Fig. 386.—Voorhees' bag in place and filled to capacity with lysol solution.

the bag is slowly filled with lysol solution. It does not make any difference really whether air or water is used. Ordinarily we go up beside the membranes if the bag goes that high. You can tell by the resistance of the bag when it is filled. A very little experience will tell you by the hydrostatic resistance when the bag is filled or you can measure the amount of fluid that you introduce if you prefer. The stem of the bag is next tied as securely as possible and a 2-pound weight is attached to the stem, and the patient stays upon her back until the child is delivered. The pains will usually begin within an hour after the insertion of the bag. They come on with regularity but at shorter intervals than in uninduced labors. The average length of dilatation is three hours and twenty minutes. Our shortest case was fifty-five minutes and our longest case was thirty hours. The dilatation is, as a rule, three fingers, or $3\frac{1}{2}$ inches. The head comes down, or the bag of waters comes down and completes the dilatation in time varying from one-half to one hour. As soon as the bag comes out the head will usually follow the bag down. The membranes will rupture spontaneously. The labor-pains become normal in strength and rhythm and more profound in character and the process is exactly the same as if nature had begun it spontaneously. In other words, we merely start the pendulum of the clock. We do not do violence to nature. We simply say to nature, "Now is the time to begin."

There are one or two points about this practice that would have made it impossible in previous years. One of them is the fact that occasionally the pains cease with the delivery of the bag. That occurred in the hands of Dr. Lynch some years ago, and has made him reluctant to undertake another series of bag cases. With the introduction of pituitrin we have overcome that difficulty. With the dilatation of the cervix and when the membranes have ruptured the use of pituitrin will reawaken the pains when they show signs of becoming quiescent and the patient will go on to a happy delivery. We use from 5 to 7 minims as a rule. The effect of pituitrin begins within five minutes and lasts fifty minutes. We have never seen a rupture of the uterus with pituitrin, and we do not believe that a ruptured uterus can follow the use of pituitrin in a normal woman if there is no obstacle to the delivery of the child, if there is no pelvic contraction, and if there is no cervical rigidity, and if there is opportunity for the child to advance. With this dose we get a much better effect than if using larger doses. We do not get the tetanic contractions of the uterus. In this case today it is the second child, and we sometimes have more difficulty than with the first because of uterine inertia.

When we first began the use of pituitrin we used the full ampules of 30 mm. Some men used two or three ampules. With 30 mm. you get a strong almost tetanic contraction of the uterus, lasting twenty-five minutes. You can conceive the effect of such contraction on the circulation of the child. We believe that with the smaller doses we do not cut off the circulation. We make the injection straight into the deltoid muscle. We frequently get very good results with 2 or 3 minims. Finally, in certain cases we find resistance to the insertion of the bag. It is usually the internal os that furnishes the resistance to the bag rather than the external os. In the case before you we had no trouble with the internal os, but we had some trouble finding the external os, which was torn and expanded.

QUESTION: What is the advantage of the bag over the catheter?

DR. REED: It is quicker, cleaner, and more efficient. I have no objections to the methods that may be used by others, such as the catheter or the tamponing of the cervix with iodoform gauze, but my experience has demonstrated that the bag is more satisfactory. The bag is a mechanical dilator to the canal, while the catheter is not. It prevents rupture of the membranes until the time comes for the membranes to rupture spontaneously. You will get a dilatation of three or four fingers in three hours and twenty minutes. With the catheter or packing of the cervix we would get an inauguration of labor in from twelve to twenty-four hours. Meanwhile with the bag the case has delivered. Furthermore, the danger of infection is greater. The bag mechanically dilates the os and dynamically stimulates the pains.[1]

Case II.—The second case is a cesarean section. This woman is thirty-two years of age. She is a primipara. She came to us with the history of having been run over by a wagon when she was twelve years old. The wagon passed across the hips. The pelvic measurements are: spines 23 cm., crests 25 cm., and external conjugate 17 cm. plus.

Now with the history of such a case we might well feel that the induction of premature labor or labor at term with a possible pubiotomy might answer all conditions, but we find that the right hip is limited in its action to about 90 degrees and is stiff and adducted, so that approach to the vulva is extremely difficult. Delivery might yet take place, however, if we put the woman in the right lateral position and drew out the left leg. But we find on examining her that there is another defect. At the distance of 4 cm. below the symphysis the pubic arch measures 4 cm. from side to side instead of 4.8 cm., which is the average. The result is that the head would be forced so far back that it would be impossible to deliver this child through the natural outlet. We are deprived then of the choice of induction of labor at term. We are deprived of the choice of letting her go to term and deliver with a possible pubiotomy, and we are, therefore, restricted definitely and directly to the cesarean operation.

The technic of this operation is relatively simple. It is far less complicated than normal labor, than it is, in other words, to deliver a crooked object through a crooked passage and do it right. It is easier to cut the Gordian knot than to untie it. Various changes in technic have been suggested by one or the other of our distinguished obstetricians, such as the fundal incision, the extraperitoneal incision, and many others, all of which have been relegated to the scrap heap. We do not find any advantage in these. One of our colleagues went so far as to apply forceps to deliver the head after the uterus was opened. This, of course, is an extravagant pursuit after variety.

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[1] In this case the bag was introduced at 2.30 P. M. and the labor terminated spontaneously at 8 P. M.

We follow the classic method of Sanger. We make a median incision and deliver the uterus. We incise the uterus, deliver the child, deliver the placenta, and sew up the uterus with three rows of sutures, and in this case, at the woman's request, we resect the tubes and sterilize her. We close the abdominal wound according to the usual technic. There is no change in this procedure unless changed conditions require it.

Question: What is the advantage in delivering the uterus?

Dr. Reed: We think the advantage comes partly in the better disposition of the drainage, which is more likely to go outside than inside. But, in addition, the child is more easily delivered and you can see more readily what you are doing than when you are working down in a hole. We usually inject pituitrin about the time we make the initial incision.

Question: Do you always sterilize the patient?

Dr. Reed: We usually leave that question to the patient. In many instances I insist that the patient be sterilized. In other cases I advise against it, depending on conditions.

Various devices have been recommended for stopping hemorrhage, but most of them are cumbersome and unnecessary. In earlier days when the operation was much newer we passed rubber tubes around the cervix, but we have found that if the incision is done with ordinary speed the uterus controls its own hemorrhage and we rarely lose any great amount of blood.

The abdominal incision has got to be large enough to deliver the child, and in all instances it will not require a much smaller incision than the uterus.

This woman was due on the 11th of June, and we figure the babe to be 52 cm. long and to weigh 8 lbs.+ This makes our case fall almost exactly on our clinic day. However, we do not believe that the induction of labor even two weeks before term, if carefully calculated, is of any particular consequence. We do believe that allowing a woman to go into labor four weeks after term is of serious consequence.

The last cesarean we did was for a carcinoma of the cervix, and a hysterectomy was done about ten weeks later. At that time the wound in the uterus showed wonderful repair and revealed excellently the smallness of the scar, which would hardly disturb any subsequent pregnancy. The whole scar was not over 1½ inches long.

I think you see now the greater ease with which this uterus is manipulated outside than if you were working down in the peritoneal cavity. We resect the tubes exactly at the uterine end and sew up the hole in the uterus. We close the abdominal wall in the usual way.

Note.—The babe weighed 8½ pounds and was 53 cm. long.

CLINIC OF DR. CHARLES A. PARKER

Home for Destitute Crippled Children

THE TREATMENT OF NEGLECTED CLUB-FEET

Summary: Demonstration of a patient twelve years of age with very severe club-feet requiring removal of the astragalus and resection of a bony wedge from the os calcis and cuboid. Review of several similar cases showing type of operation and results.

May 22, 1918.

Among the commoner types of congenital deformities there is perhaps none whose correction is more thoroughly appreciated by the patient and his intimates than that of club-feet, unless, possibly, that of harelip. The personal appreciation is likely to be particularly keen if the afflicted individual has reached adolescence or adult life before the correction is made. Although the patient upon whom we are to operate today is but twelve years of age, she is large for her years and is already very conscious of her affliction. We know such feet a few years hence would virtually mean social ostracism for her. Some inefficient attempts have already been made to correct them. You will observe, however, that the condition, which effects both feet equally, is of an extreme type of equinovarus with a large projecting bursa developed upon the outer and upper side in the cuboid region upon which most of the weight is borne in walking, instead of upon the sole, which does not lie upon the floor and bears no weight whatever (Fig. 387).

These younger persons can walk without shoes, but in older people the pressure is so poorly borne that they can hardly take a step without padded shoes. *x*-Rays of these feet show defective astragali with other bone changes.

Operation.—This condition has long since passed the stage of braces, plaster casts, and tenotomies. Nothing will suffice but extensive bone resection and reconstruction. The essential elements of relief are the complete removal of the astragalus and a wedge-shaped resection of the os calcis and cuboid.

A single curved incision extending from above and in front of the outer malleolus downward and forward terminating near the base of the fifth metatarsal bone allows a ready removal of the defective astragalus, and the necessary wedge-shaped resection of the os calcis and cuboid to correct the outer convex border of the foot (Fig. 388).

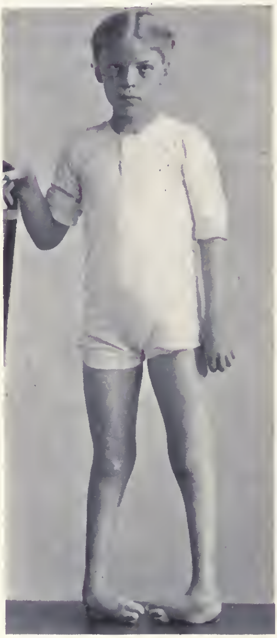

Fig. 387.—Patient before operation.

The removal of the astragalus is accomplished with semi-sharp bone instruments that hug closely the periosteum after the ankle and subastragaloid joints have been opened with the knife. When this bone is removed there is immediately considerable freedom of movement of the foot in this region.

With the tissues well retracted the bony wedge is now removed from the calcaneocuboid region by means of an osteotome, the peronei tendons being held out of the field. The size of the wedge depends upon the correction necessary. In this child it is about 1½ inches wide at the outer side, or base, and its apex extends nearly to the inner side of the foot. With this removed the correction is easily made except for a slight amount of varus remaining (Fig. 389). This is overcome by removing a portion of bone from the outer and upper surface of the os calcis. As the correction is good and easily maintained the wound is closed with a few catgut sutures approximating the bone surfaces and the skin closed with black silk. No tourniquet has been used and there are no vessels to be tied. Rais-

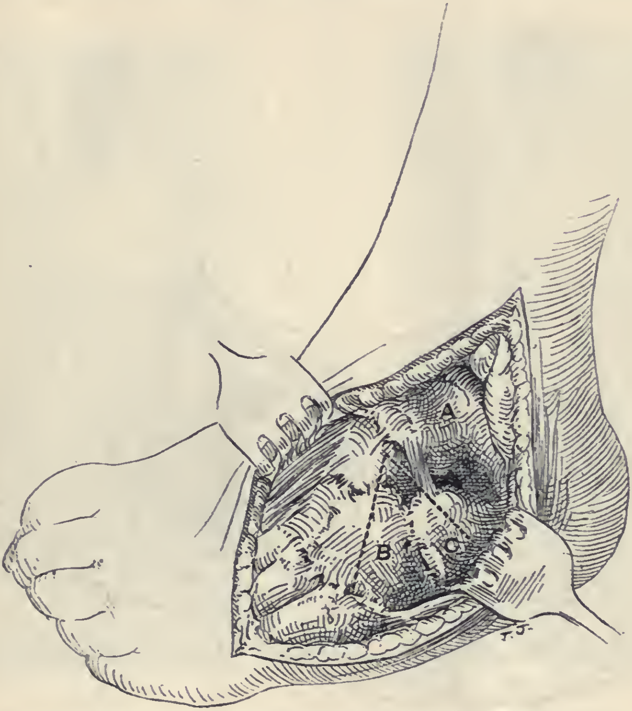

Fig. 388.—Sketch showing structures exposed by the incision. Dotted line represents wedge of bones to be resected after removal of the astragalus: *A*, Astragalus; *B*, cuboid; *C*, os calcis.

ing the lower end of the operating table 6 inches has materially diminished the venous bleeding.

The removal of the astragalus relaxes the tendo achillis so much that it usually does not have to be cut, and all other tendons are preserved intact.

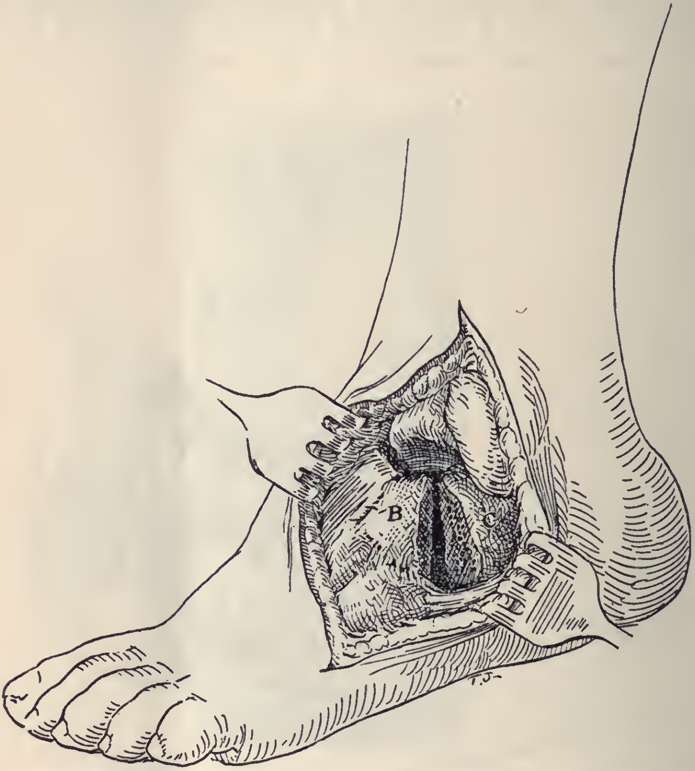

Fig. 389.—Sketch showing relation of parts and corrected foot after the bone operations are completed: *B*, Cuboid; *C*, os calcis.

The left foot having been completed, the right is treated in a similar manner.

After proper dressing a plaster cast is now applied to each foot to maintain the desired correction. This will be changed in two weeks to remove stitches and then reapplied for a period of six to eight weeks, during the latter part of which time the child shall walk in its casts.

It takes considerable practice for older people to inure the sole to the purpose for which it is designed after so many years of non-use, but pride is an efficient stimulant and normal shoes are early sought. The corrected foot is always shorter than the normal foot. This is no great disadvantage in buying shoes, as the ends can be filled out with false work or short shoes, made to order, can be worn. As the feet are so broad compared with their length, shoes resembling custom shoes are the ones generally chosen.

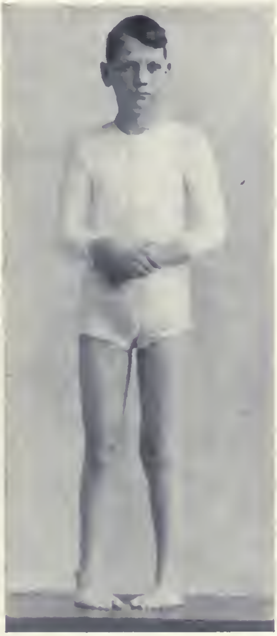

Fig. 390.

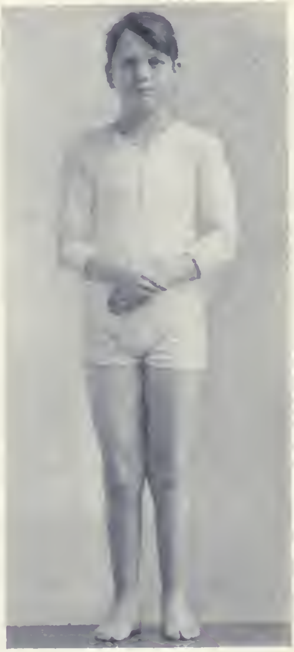

Fig. 391.

Fig. 390.—Twelve-year-old boy recently operated upon. Before operation.
Fig. 391.—Boy shown in Fig. 390 several weeks after operation.

Club-foot will not relapse after this operation, although, if it is not properly done, the correction will still be incomplete, at whatever stage it is left, and in that much unsatisfactory and disappointing.

The ankle-joint will not become completely stiff and the movements of the foot will probably be as free as they were before the operation. As to the result we may reasonably expect in this case, I show you several photographs of similar cases previously operated upon.

This (Fig. 390) is the photograph of a twelve-year-old boy recently operated upon in whom the deformity consisted principally of a marked convexity of the outer side of each foot with in-toeing, the soles being flat on the floor, either the result of earlier treatment or a special type of in-toeing feet. The astragalus was not disturbed in this case, a wedge-shaped resection of the calcaneus and cuboid well sufficing for the correction, as shown in the next photograph (Fig. 391), taken a few weeks later.

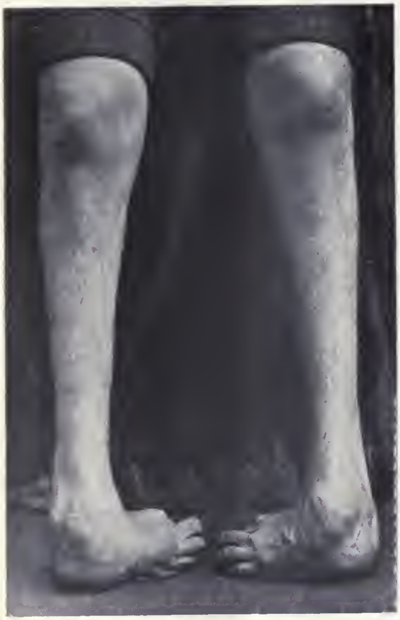

Fig. 392.

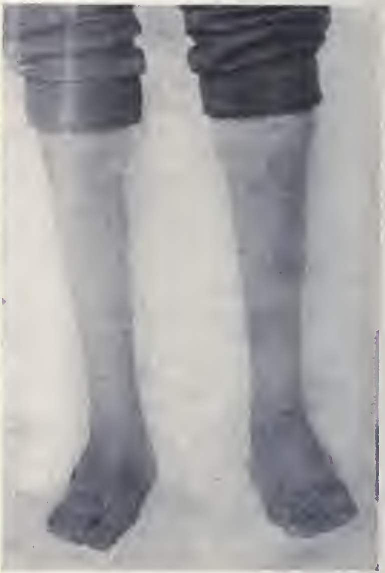

Fig. 393.

Fig. 392.—Feet of a young man nineteen years old before operation.
Fig. 393.—Feet of young man shown in Fig. 392 after operation.

The photographs I now show you are of adults with extreme types of the deformity, like the one operated upon today.

This one (Fig. 392) is of a young man nineteen years old who had his feet so well trained that he could walk with his heels forward so the toes would not interfere. He had had four unsuccessful attempts at correction. This (Fig. 393) shows his feet several months later when the final casts were removed.

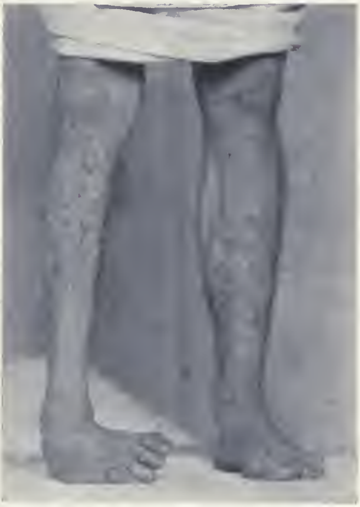

Fig. 394.

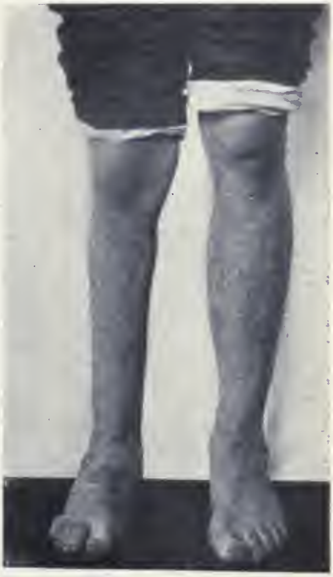

Fig. 395.

Fig. 394.—Young man in early twenties before operation. Right foot affected.
Fig. 395.—Same as Fig. 394 after correction.

This (Fig. 394) is a photograph showing only the right foot affected in a man in the early twenties. The accompanying photograph (Fig. 395) was taken a few months after correction. In each of these cases the operation was similar to the one performed today.

I show you one more photograph (Fig. 396) that properly belongs to this series. The feet are those of a man thirty-seven years of age who had never had any attempts at correction.

The feet were corrected as in the other cases and an exposure for a photograph subsequently made, but the negative was spoiled during the developing, according to the photographer, and the patient had left town for another state before this was known. Requests for photographs brought no results. It was a gratuitous case and perhaps the results did not suit.

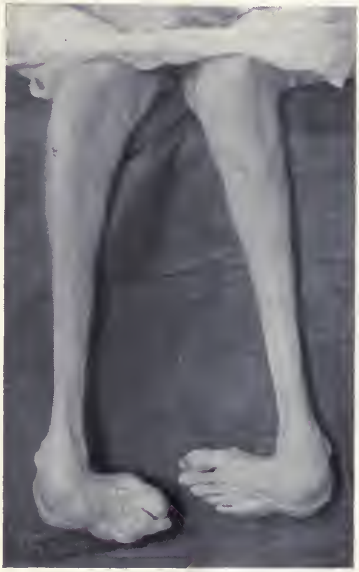

Fig. 396.

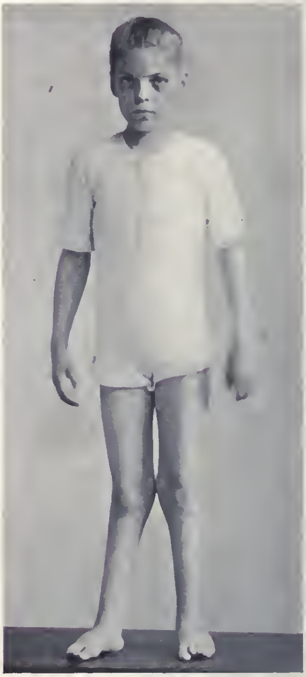

Fig. 397.

Fig. 396.—Feet of a man thirty-seven years old before operation. The "after-operation" negative was destroyed by the photographer.

Fig. 397.—Same patient as Fig. 387 a little over two months later.

We believe our patient today will show more appreciation, and we hope to give her feet that she will at least be willing to have compared with those she had on entering the operating-room.

Postscript.—The patient operated on in the clinic just reported made an uneventful recovery; the result after two months is shown in Fig. 397.

CLINIC OF DR. MAURICE A. BERNSTEIN

WESLEY HOSPITAL

TENO-PERITENDINOUS TRANSPOSITION—AN IMPROVED TECHNIC FOR TENDON TRANSPLANTATION

Summary: Two cases of paralysis of certain muscles of leg and foot following infantile paralysis—restoration of function by teno-peritendinous transposition. Rationale of the method—gross and microscopic anatomy of tendons and its bearing on the technic of tendon transplantation.

THE case which I am going to show this morning is that of a boy ten years old, who, about six or seven years ago, had a short siege of illness febrile in character and in which no diagnosis was made at that time. The boy apparently recovered, but shortly afterward the mother noticed that the child's right foot dragged somewhat when he walked and there was a distinct limp. The limp became worse and the foot began to turn out. I mention only that part of the history which has a direct bearing upon the present trouble. It is a typical case which comes to the surgeon years after an unnoticed or insignificant short siege of illness. What is the trouble with the boy? What is the trouble with most cases of a similar nature? What is the condition which comes, unnoticed, perhaps, with a slight elevation of temperature, general indisposition and vomiting, lasting a day or two or a week, and diagnosed as a mild case of gastro-intestinal disturbance, and a month or two or three afterward followed by a slight paralysis of one or more muscles in an extremity? It can be only one thing, and that is poliomyelitis anterior.

Poliomyelitis anterior has a peculiar selective method of paralysis. I do not mean that only one muscle is affected during the initial onset of the disease. The usual pathologic picture is one which involves an entire group or perhaps one or more muscles in several groups. After the acute symptoms have subsided and the destructive process has reached its maximum, nature begins its reparative process and a large number of muscles regain their normal, or nearly normal, integrity. It occurs that one muscle, or group of muscles, either because of improper treatment following the acute attack, or because of the virulence of the infection, becomes permanently disabled. Koch, quoted by Huffa, says that a fatty degeneration takes place in the muscles affected, and that shortly afterward a reconstructive change takes place, restoring to normal, or nearly normal, those muscles which have been involved.

I shall deal principally with the surgical phase of this subject, namely, tendon transplantation. This subject has received considerable attention from the clinical standpoint, especially at this time, when injuries to muscles and nerves are received in overwhelming numbers. I am referring to the war zone and reconstructive surgery. Here is an opportunity to try out this method, although one can say that it is no more a trial. We are getting definite results along definite lines.

The indications for tendon transplantation must be definitely established: 1. No tendon transplantation shall be done until the muscles have been placed in the most favorable position for regeneration. This takes, as a rule, from one to two years, during which time reposition, massage, and electricity must be systematically carried out. 2. No inferior muscle shall be transplanted to perform the work of a strong superior predominating muscle. 3. No muscle shall be transplanted unless it has been proved to be a functionating healthy muscle. 4. A knowledge of the anatomy and physiology and surgical peculiarities of tendons is indispensable for a successful tendon plastic. 5. The importance of asepsis should be emphasized.

I shall give you a working anatomic basis, as briefly as space will permit, for I feel that, in order to understand this work, one must familiarize himself with the special anatomy of tendons. Here is a chart taken from Mayer; it is a longitudinal cross-section of a tendon with its sheath, its blood-supply, and

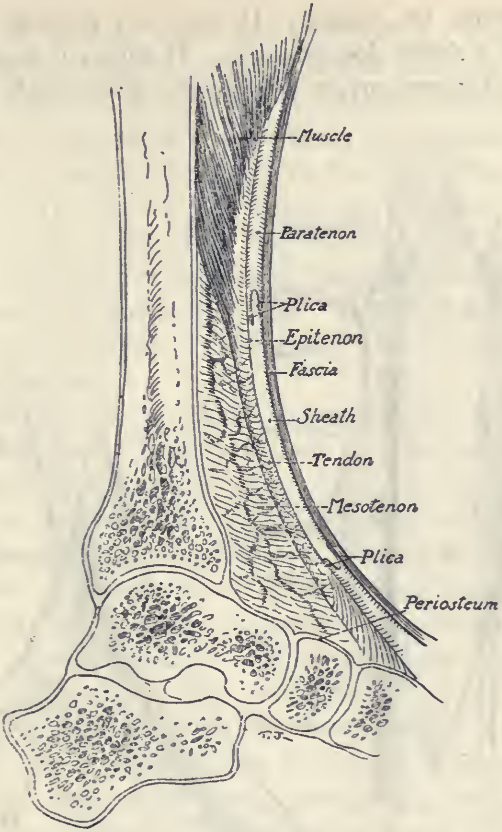

Fig. 398.—Cross-section of an extensor tendon. The peritendinous tissue shown in the illustration is made up of the following structural units: *Paratenon,* an areolar connective tissue which is found at the upper pole of the tendon and has special gliding quality. *Plica,* an invagination of areolar tissue which is attached to the tendon, and glides back and forth with it. *Sheath,* a closed synovial sac containing synovial fluid. The sheath is found when the tendon changes its direction and when it plays over ligamentous structures. *Mesotenon,* a layer composed of loose connective tissue and carries the blood-supply to the tendon. The blood capillaries extend over the surface of the tendon in the epitenon and send small branches into the tendon along with the endotenon. *Epitenon,* a delicate endothelial structure covering the surface of the tendon, sending small septa into the tendon, separating it into small bundles. (Modified from Mayer.)

its relation to the muscle (Figs. 398 and 399). This which you see is the tendon. It is of white elastic fibers. This which you see is its sheath. You will notice that the sheath is loosely applied around the tendon. It does not encircle the entire tendon like a sleeve does the arm. It covers it much like the visceral peritoneum covers the bowel. This which you see is a loose fatty areolar connective tissue. It follows the tendon into the sheath. This tissue is continuous with the parmysium, perinurium, and the adventitia of the blood-vessels; it is called the paratenon. Upon it depends, to a great extent, the gliding

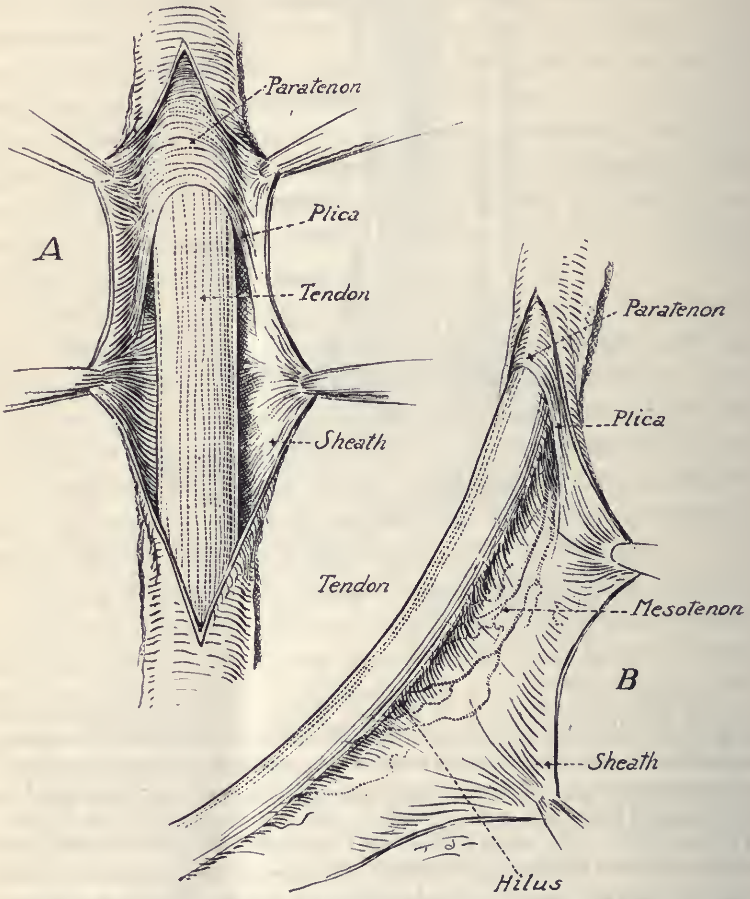

Fig. 399.—Structures that are carried over with the tendon in the transposition operation: *A*, Anterior view. Sheath incised and edges retracted. *B*, Lateral view.

mechanism of tendons. This which you see is the plica. It is a loose connective-tissue structure which is attached to the tendon and invaginates, forming clefts, when the tendon contracts and relaxes. This fold is of importance in the limiting of tendon gliding. The plica is lined with the same cells which line the sheath. The sheath has been compared to a synovial cavity in that it is definitely circumscribed and lined with a layer of cells which can be termed synovial in character, and which secretes a synovial-like fluid. This fluid lubricates the tendon during its phase of contraction and acts like a buffer against traumatism.

Here you see the mesotenon. You notice that this tissue which is composed of a loose connective-tissue structure carries the blood to the tendon (Fig. 399). It is much like the mesentery of the intestine. You see here how the blood-vessels ramify and anastomose in it. You see these little red lines? They are blood-vessels which ascend from the mesotenon and encircle the tendon and send small off-shoots between the tendon bundles. You see how important the mesotenon is. It is almost as important as the mesentery.

Where does the tendon get its blood-supply? This inquiry has brought out various opinions by different observers. It is now generally believed that the blood-supply to the tendon comes from the mesotenon, periosteum, and from the surrounding connective tissue. We are yet to learn the principal source of blood-supply to the tendon.

Wallenburg was unable to demonstrate, either in the newborn or in the adult, arteries which started from the muscle belly or from the insertion into the bone or ligaments that ran in a longitudinal direction into the interior of the tendon. If the areolar sheath was dissected away no injected vessels were visible.

Ancola has shown experimently that the intactness of the sheath is necessary for perfect nutrition of the contained tendon and, on the other hand, that complete removal of the sheath is not followed by necrosis of the tendon.

The integrity of the relationship between the tendon and

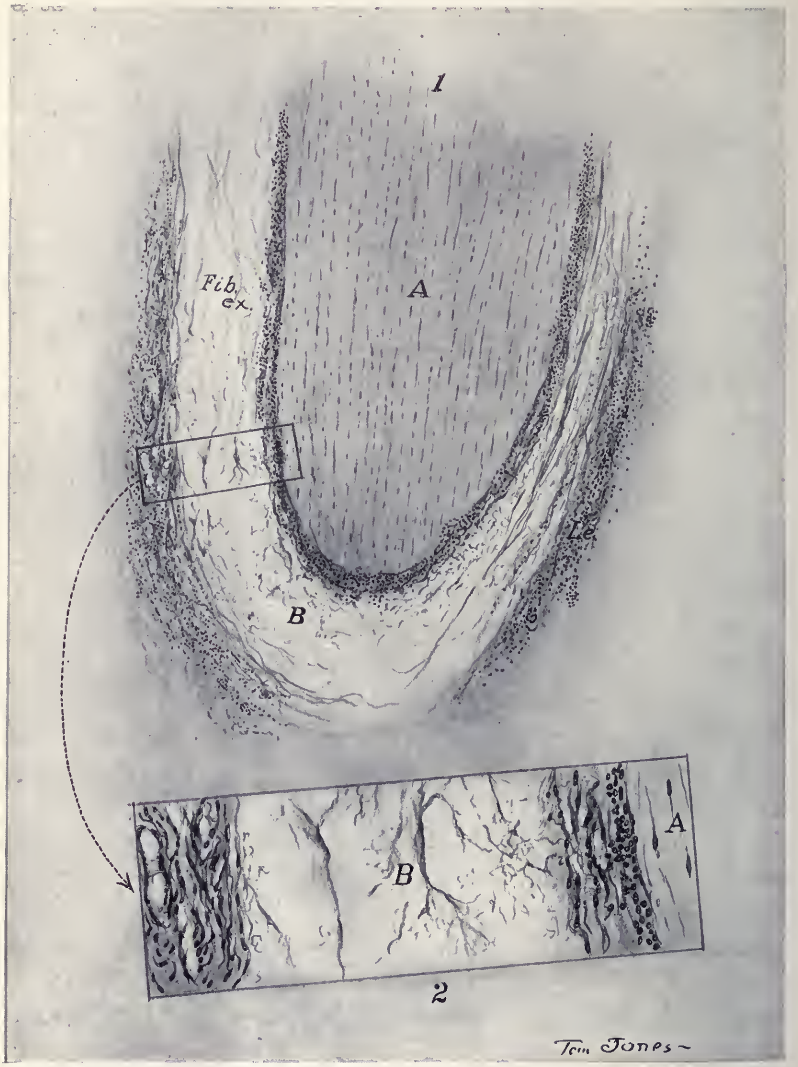

Fig. 400.—Extensor longus tendon transposed through sheath of tibialis anticus: 1. Low magnification—camera lucida: *A*, tendon; *B*, sheath. Notice the marked fibrinous exudate into the sheath with beginning organization. In the right space long bands extend along the tendon edge. *B*, 2. Same as above—high magnification. Sheath wall markedly proliferated; young blood-vessels can be seen in sheath wall and marked leukocytic infiltration is also visible.

its sheath therefore must be maintained in the transplantation of tendons, since the nutrition of a tissue or organ is of the utmost importance in the maintenance of its vitality and proper function. Sturmdorf makes a statement which one should commit to memory: "The functional integrity of any organ depends essentially on the maintenance of a uniformally normal circulatory equilibrium." This applies to any tissue or organ, especially to tendons where the blood-supply is comparatively poor.

We cannot pass this subject without paying a high tribute to Mayer in recognition of the splendid work which he has done along this line. I would recommend his book to anyone who is interested in this work. The book is full of beautifully colored illustrations and brings the subject up to date.

In examining this boy we find a foot which yields readily to manipulation. I can extend his foot passively, as you see, to beyond a right angle. But he cannot retain it in that position because he has lost the function of his tibialis anticus, which, as you know, is the most powerful extensor and invertor of the foot. This boy has been operated upon before, as you see from this scar. An attempt was made to anastomose a flexor tendon to the tibialis anticus. But the tendon did not hold. You see how freely the skin moves above the tendon. When he extends his foot this tendon can be seen gliding freely beneath the skin. I shall resect this tendon for microscopic examination to note the change which has taken place in it. The sheath of this tendon is intact and will be of special interest to us from the anatomic point of view. Here is a bursa; it is located on the internal malleolus and is due to the rubbing of the brace on the prominent portion of the tibia. The condition is exaggerated by the weight of the body being directed through the tibia to the internal malleolus. These patients often develop an abrasion on these bursæ which does not yield readily to treatment, and is very painful because the periosteum is often eroded.

I am going to transplant his peroneus longus tendon to do the work of the tibialis anticus. I am going to convert this abductor muscle into an extensor. I am not going to use the Mayer method, because I desire to maintain the normal relationship of the tendon to its sheath. Mayer builds up a colossal anatomic structure which collapses when he removes the tendon from its sheath. He removes the tendon from its sheath and severs the mesotenon and then transplants the tendon through the sheath of the paralyzed tendon. I am impressed with the fact that the tendon sheath of the paralyzed muscle acts only as a canal guide for a physiologic line of traction. There is no particular anatomic difference between fat, fascia, cargyle membrane, or sheath. They are all foreign materials covering the tendon, and react more or less in a uniform manner to the tendon as regards adhesions. All authors emphasize early motion to avoid adhesions. Early motion will avoid adhesions to a certain extent, whether the tendon has been transplanted through anyone of the above-named structures. Kauffman says that a tissue will become specialized when called upon to perform a certain definite function. That is to say, that fascia or fat will assume the characteristics of a tendon sheath when tendon is made to play through it for a given period of time. And so we will say that the sheath of another tendon is an abnormal covering for a given tendon just as fascia, fat, or cargyle membrane, and becomes specialized from continued function.

What happens when a tendon is transplanted subcutaneously into fascia? What happens when a tendon is transplanted through the sheath of another tendon? There is a difference in the microscopic picture of the two. In the first, where the tendon is transplanted through fat or fascia, injury occurs to the tendon covering, that is, the epitenon or, as it is known in its old terminology, the peritendineum externum (see Fig. 398). This peritendineum is torn or traumatized in the act of its transference. There is a little difficulty in forcing the tendon down through the newly formed canal, and during its passage the surface of the epitenon is rubbed off. There also follows a traumatic reactive inflammation to the tissues forming the new canal. This is followed by the usual reactive processes, namely,

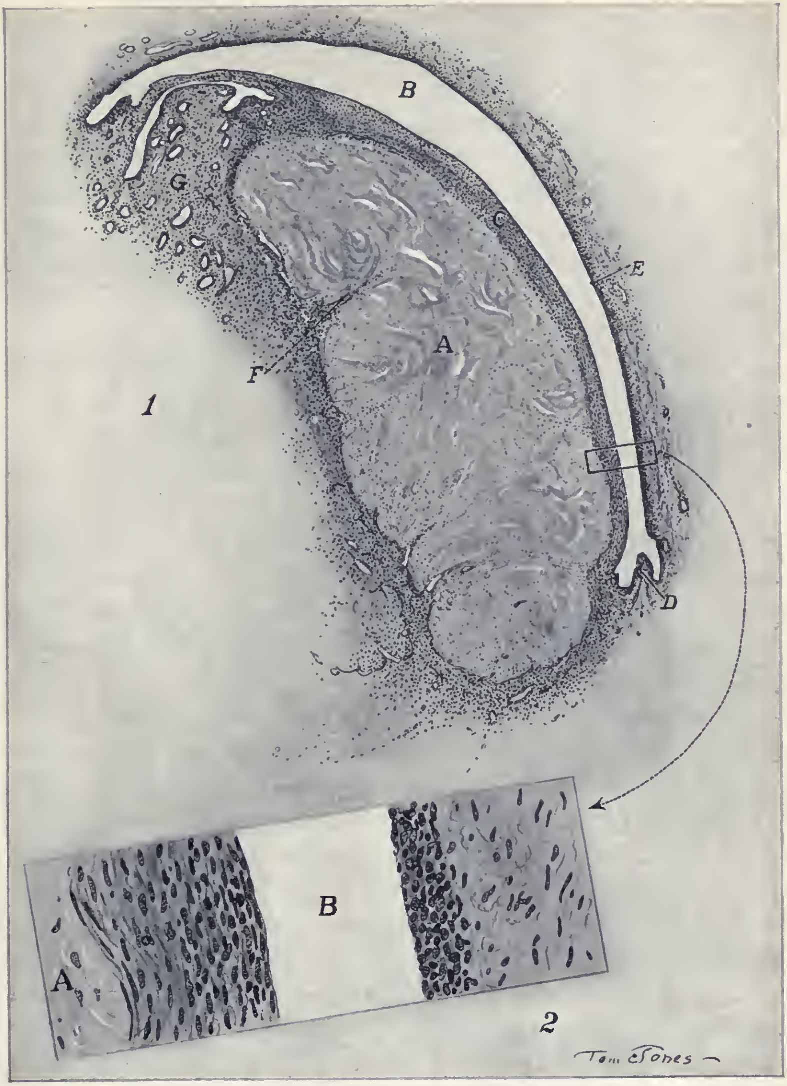

Fig. 401.—Microscopic section through tibialis anticus of a dog twenty-one days after teno-peritendinous transposition: 1. Low magnification—camera lucida: *A*, Tendon; *B*, sheath; *C*, epitenon; *D*, plica; *E*, outer sheath wall; *F*, septum; *G*, vessels in mesotenon. Sheath appears clear. Some leukocytic infiltration due to slight skin infection. Notice no proliferation, exudation; no infiltration of sheath (*B*). 2. High magnification of same section: *B*, Sheath perfectly clear in spite of marked leukocytic infiltration. The long cigar-shaped cells are proliferated synovial cells from the sheath walls.

exudation, coagulation, proliferation, and organization. The degree of exudation and proliferation of both surfaces varies with the amount of trauma. After the acute process has subsided, absorption takes place. There remains, however, as a result of the above reactive inflammation delicate fibrinous adhesions; when these adhesions are permitted to remain organization takes place and fibrous adhesions result, fixing the tendon to its new canal. The fixation by adhesions is greatest when they occur at some fixed point, as, for example, bone or ligamentous structure.

The histologic picture which is seen when the tendon is transplanted through the sheath of another tendon is quite different (see Fig. 400). What occurs is this: the rough distal end of the tendon during its course through the sheath rubs the delicate endothelium off from the sheath; added to this is the invagination of the plica, which folds up and forms villous projections. These villi (Fig. 401), if we may be permitted to use that term, are covered by the same character of cell as is the sheath, and as a result of the pulling of the tendon end these are torn off.

The inflammatory reaction which follows causes an exudate into the sheath (Fig. 401). This consists of blood, plasma, and cells from the sheath and the epitenon, and fills in the space between the tendon and the newly formed sheath. This exudate is soon infiltrated by leukocytes. The process extends into the wall of the sheath, causing proliferation of the endothelial cells of the sheath. Thus, the endothelial layer of the sheath is thickened and the number of cells is increased. A similar proliferative reaction takes place in the epitenon and extends along the septi, that is, the peritendineum internum fixing itself to the tendon bundles. It has been demonstrated that if adhesions do take place to the surface of the tendon motion is interfered with. The amount of interference will depend upon the elasticity of these adhesions. By constant gliding of the tendon these adhesions will soon become elongated, and often may disappear to an appreciable degree. The pain caused by the operation prevents early motion to a great

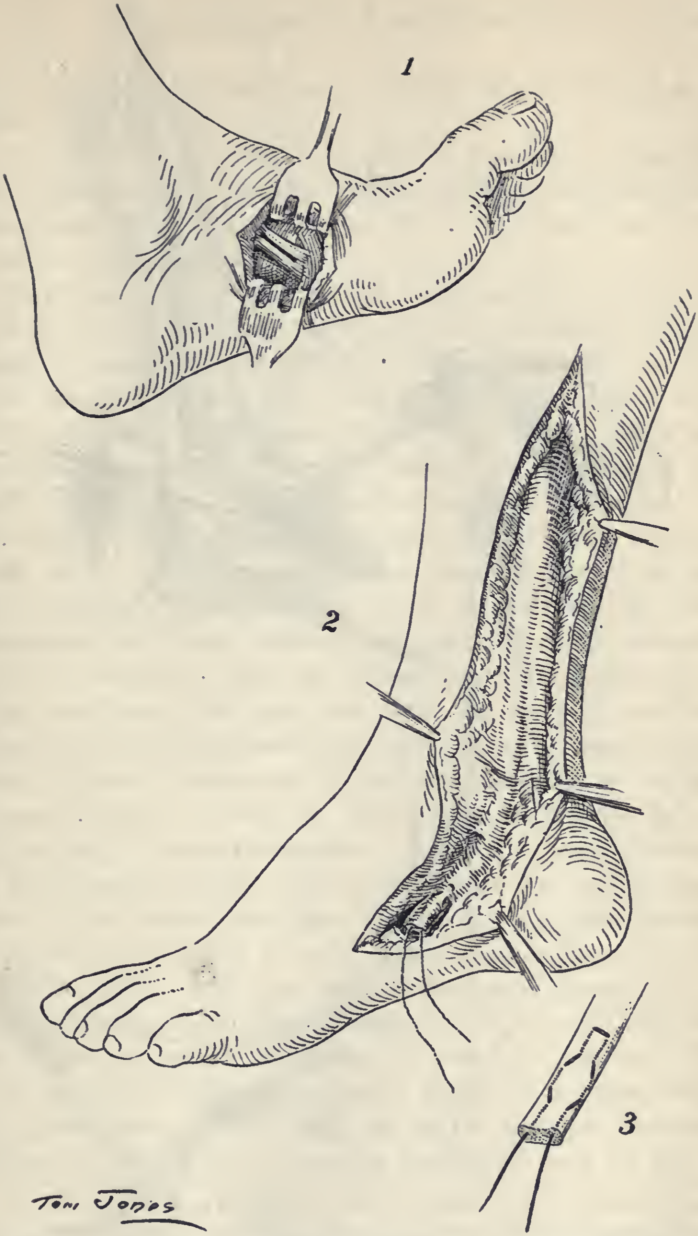

Fig. 402.—1. Site over internal cuneiform prepared. Tendon of tibialis anticus split for the reception of peroneus longus tendon. 2. Fixation suture in place and dissection of peroneus longus tendon begun. 3. Retention suture—method of introduction.

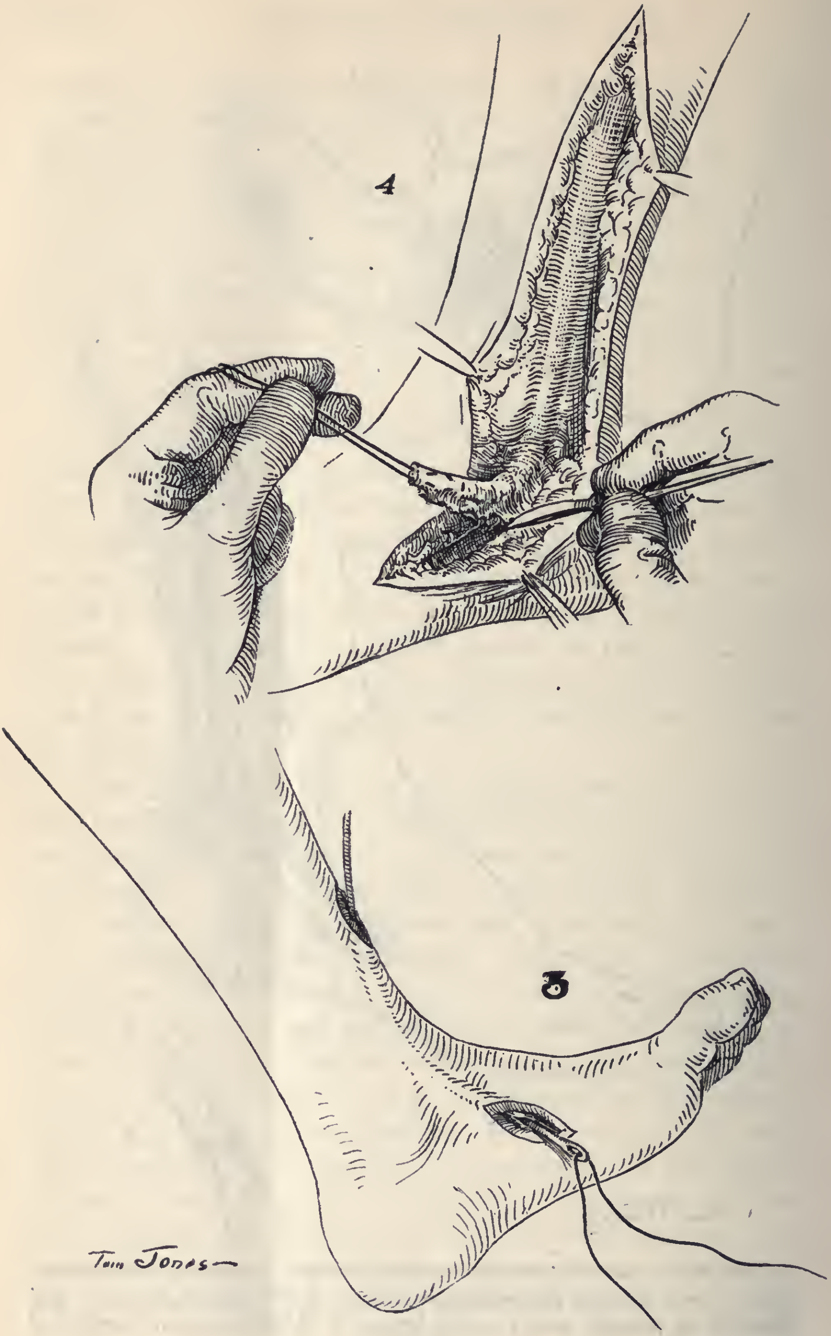

Fig. 403.

extent; especially is this true in the case of the fingers and hands.

The point which I wish to emphasize, therefore, is that the tendon should be transplanted with its sheath in order that the normal relation of the tendon to the above-named anatomic structures may be maintained.

Operation.—The incision for the transplantation of the peroneus longus is rather long, but it must be so in order to expose the entire tendon. The incision is, therefore, made midway between the tibia and fibula and midway between the knee and outer malleolus. Before doing that I am going to prepare the site for the implantation of the tendon, because I want to handle the tendon as little as possible (Fig. 402, 1). I make the first incision, therefore, over the insertion of the tibialis anticus, which, as you know, is the lower and inner surface of the internal cuneiform bone and base of the first metatarsal bone (makes straight incision and exposes tendon of tibialis anticus, splits the tendon, and cuts down on periosteum, traumatizing internal cuneiform). We will now make the incision over the peroneus longus (makes incision as above indicated, sweeping in curved manner to outer side of external malleolus to beyond peroneal tubercle—Fig. 402, 2). We preserve the deep fascia and will transplant it with the tendon. We must be careful not to cut the peroneus brevis. The two muscles are closely associated at the external malleolus and occupy the same sheath for a distance of about ½ inch. The peroneus longus is the outermost of the two. You see the tendon is covered by a sheath of loose areolar tissue. I can pick it up with my forceps. I am not going to separate it from the tendon. The fascia covering a tendon has a special gliding mechanism. The fascia glides back and forth with the tendon, giving it a greater amount of play. Before removing the tendon from its bed I

Fig. 403.—4. Fixation sutures in place. Dissection of the peroneus longus begun. When the longus and brevis occupy the same compartment a larger portion of the sheath is carried over with the peroneus longus. The rent in the sheath is fixed by continuous catgut Lembert suture. 5. Probe along new tract for the transplanted tendon, carrying a guide suture which is brought out in a loop in Fig. 404, 6.

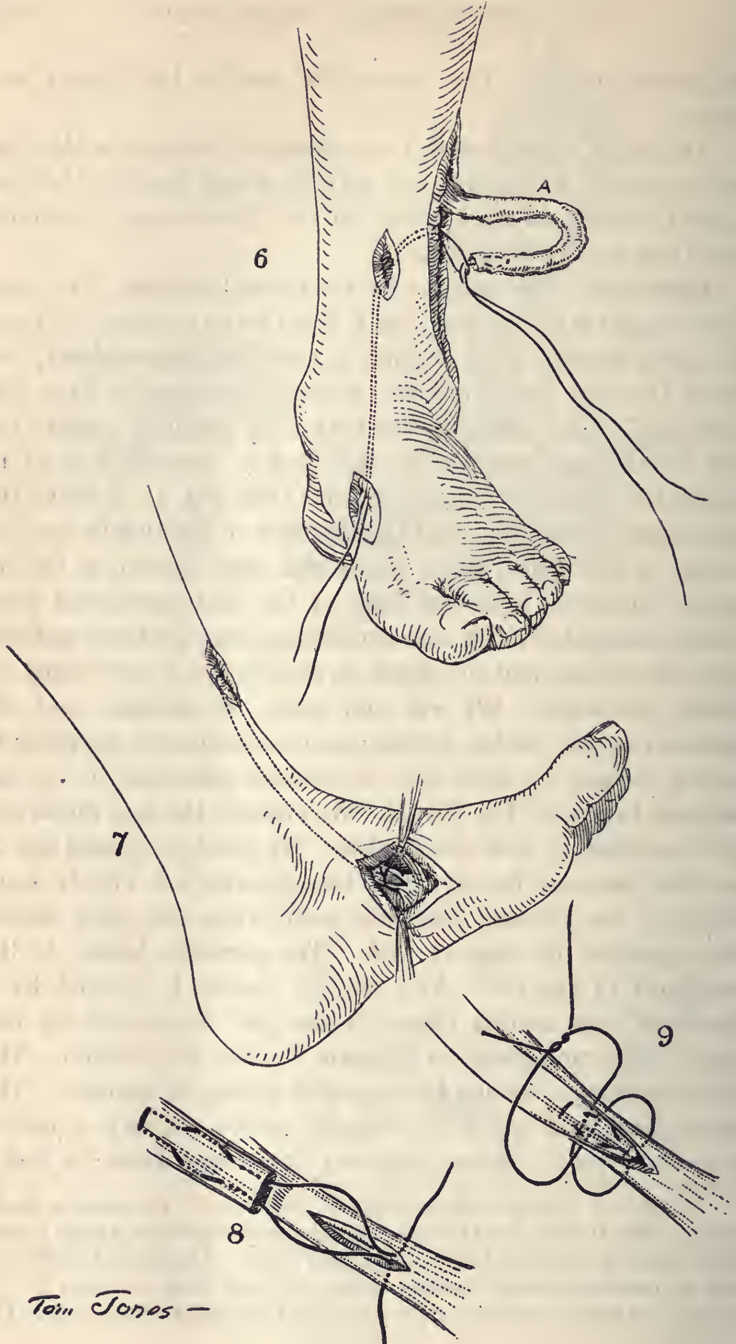

Fig. 404.

am going to place my silk fixation sutures. The insertion of the suture is facilitated when the tendon is in its place. I am using the Schede modification of the Lange stitch (Fig. 402, 3). It is important to place these sutures properly because pressure produces necrosis of the tendon. Silver has shown that silk sutures, when placed transversely across the tendon, cause local necrosis. The experiments which he carried out were for the purpose of determining not if necrosis of the tendon occurred, but whether this necrosis interfered with the union of the tendon.

Now you see how easily I can handle the tendon by means of this fixation suture. (Severs the tendon beyond peroneal tubercle.) Now I raise the tendon out of its bed. You see these fibers as they extend to the tendon (Fig. 403, 4). That is the mesotenon. You see these little red lines. They are the fine blood capillaries entering into the tendon. I save as much of the mesotenon as possible and, therefore, cut in a direction away from the tendon, taking as much surrounding tissue as possible. I free the tendon to the lowermost muscle-fibers. Now the assistant holds the tendon, protecting it with pledgets of cotton moistened in salt solution to avoid drying from exposure to the air.

I now introduce an eye probe along the deep fascia downward and inward to the tibialis anticus muscle in front (makes an incision in the skin and carries the silk suture through this aperture—Fig. 403, 5). I insert the probe again along the tibialis anticus muscle underneath the annular ligament, and out through the first incision, carrying the suture through that opening. The assistant now steadies the tendon, straightens it out while I pull it through the track made by the silk suture (Fig. 404, 6). You see how the tendon descends down through this track, and now it emerges through the first incision over the

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Fig. 404.—6. Fixation suture caught in loop of traction suture. 7. Peroneus longus sutured to insertion of tibialis anticus and inner surface of internal cuneiform bone. 8. Method of fixing tendon to new insertion. Each end is brought out at the lower angle of the split tibialis anticus tendon. 9. A loop is made and needle is reinserted through split tendon and transplanted tendon. The other end is brought out in the same manner and the ends are tied. This forms a figure-of-8 stitch.

insertion of the tibialis anticus. The assistant now extends the foot while I introduce the sutures through the split tendon of the tibialis anticus and periosteum. The two ends of the suture being inserted, I now pull the tendon snugly into the slit and fasten it by several stitches (Fig. 404, 7–9). The skin is closed by interrupted silkworm sutures. The limb will now be placed in plaster in an extended and abducted position. We will cut windows in the cast and remove the sutures in ten days. The cast will remain for six weeks. We will then begin passive motion and massage after that time.

Postoperative Comments.—I have carried on experiments on tendon transplantation for the past year and have arrived at very interesting conclusions, which I hope to publish in detail in a short time. The microscopic sections (see Figs. 400 and 401) which I have submitted are from our animal experiments at Northwestern University Medical School.

Case II.—This case is the opposite of the former. It is a case of paralytic valgus (Fig. 405). The patient is twenty years of age. When she was ten years old she had an outspoken attack of infantile paralysis, involving both lower extremities. After a few days of acute febrile symptoms, namely, fever, vomiting, and general malaise, she found that the power in her limbs disappeared. The function in the left leg returned completely, but she found that when she began to walk the right foot was weak, and gradually began to turn in.

Examination.—Right leg shows some degree of atrophy. She can adduct and extend her foot, but cannot abduct it. The tibialis anticus is strong and healthy, as is the extensor hallucis longus. In her case the peronei muscles are functionless, and I am going to transplant the extensor longus hallucis to the outer side of the foot to the insertion of the peroneus tertius.

I believe that there is some power in these peronei muscles, although the patient seems to exert no effort to evert the foot. In those cases where the muscles have become paretic, that is, where there has been no complete loss of function, the tendons become elongated, as Jones has shown, and as a result the power in the muscles appears to be completely absent. It is in this type of cases that the Gallie operation is contraindicated. The Gallie operation should be employed only in those cases where there is a complete loss of function in the muscles. The Gallie operation is nothing more than a tendinous fixation of the foot and does not restore the function of partially paralyzed muscles. It is, therefore, done in those cases where the muscles are hopelessly destroyed. By transplanting a healthy muscle to the outer side of the leg it will aid in restoring the latent power which we think exists in these paretic muscles.

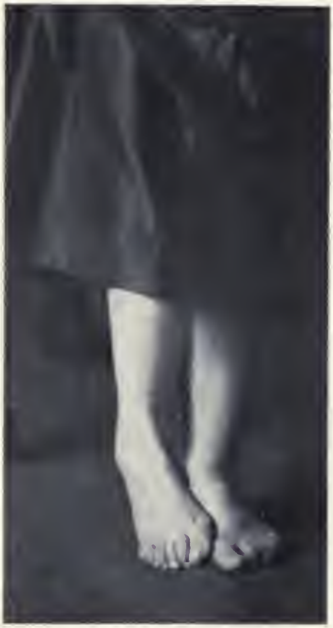

Fig. 405.—Case II. Photograph before operation. Notice abducted position of foot.

Operation.—The incision is made from about 1 inch above the malleolus to the base of the first metatarsal bone (Fig. 406). (Makes incision through skin exposing the extensor longus hallucis muscle.) I am preserving the deep fascia and I am going to transplant it with the sheath. The fixation suture is placed in the same manner as in the former operation (Fig. 407). You see that I do not sever the tendon from its insertion before introducing the fixation suture. We will sever the tendon at the base of the first metatarsal bone. This will make it sufficiently long to be carried over to the insertion of the peroneus tertius. An incision is made with the knife on both sides of the tendon for a distance of ¼ inch through the peritendinous tissue (Fig. 407). The tendon is now raised by means of the fixation silk suture out of its bed. The surrounding connective tissue is cut on both sides of the tendon with the scissors as high up as the lowermost muscle-fibers, carrying the peritendinous tissue with it (Fig. 408). It is necessary, in doing this, to sever the annular ligament. The tendon is now freed, and, as you see, it is covered by the sheath and its specialized anatomic structures, together with the special gliding fascia. An eye

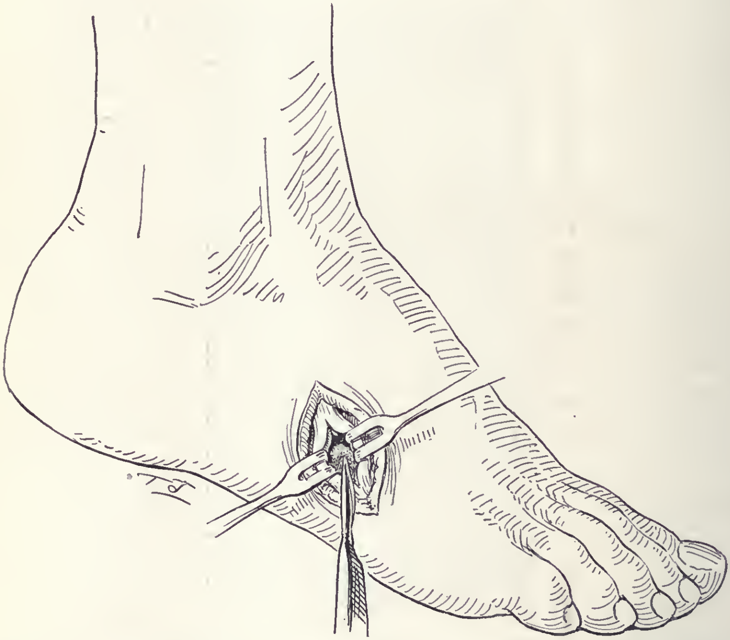

Fig. 406.—Implantation site in the base of the fifth metatarsal bone prepared. Peroneus tendon split and edges retracted.

probe is now passed along the peroneus tertius muscle beneath the annular ligament to the upper surface of the base of the fifth metatarsal bone. I now enlarge the incision at the point of exit of the probe and expose the tendon of the peroneus tertius at its insertion. The probe which is still in place is now threaded with the fixation suture, which is attached to the distal end of the extensor hallucis tendon, and pulled through

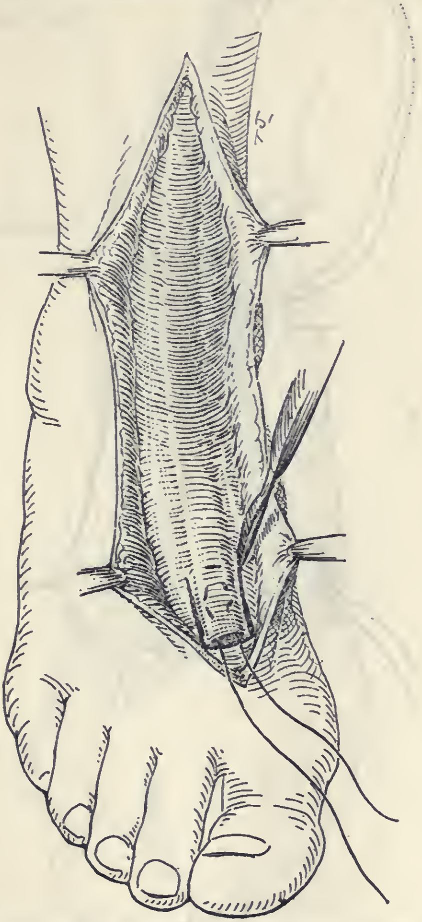

Fig. 407.—Incision through skin and superficial fascia. Extensor longus hallucis tendon exposed. Fixation sutures in place. Dissection of tendon together with deep fascia begun.

the lower incision carrying the silk thread with it (Fig. 408).

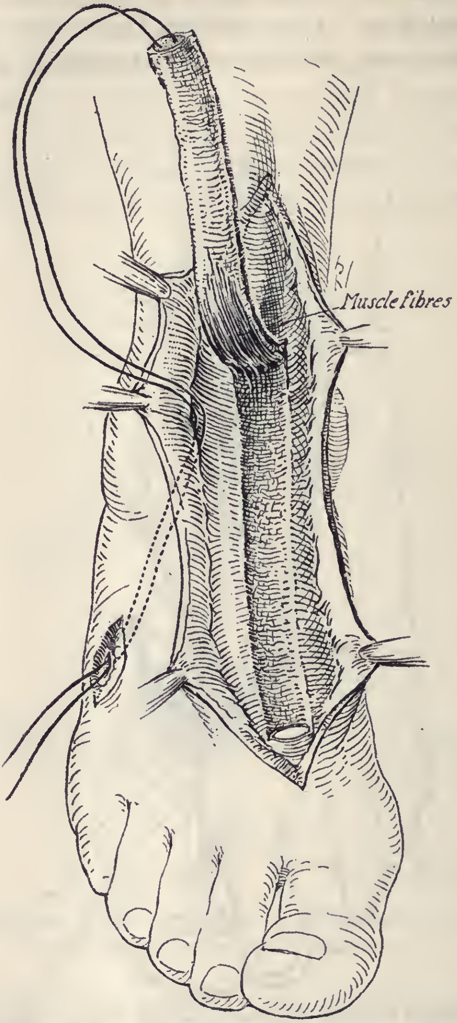

Fig. 408.—Dissection of the extensor longus hallucis tendon from an anatomic study. This illustration shows what structures are carried over with the tendon in our transposition. The tendon was removed as in our operation and the sheath opened. The mesotenon remains.

Now I pull the tendon down through the new canal. Here it can be seen emerging through the lower incision. I now fix the distal portion of the extensor hallucis tendon between the split tendon of the peroneus tertius and the traumatized periosteum of the fifth metatarsal bone. This is done as illustrated in Figs. 408 and 409.

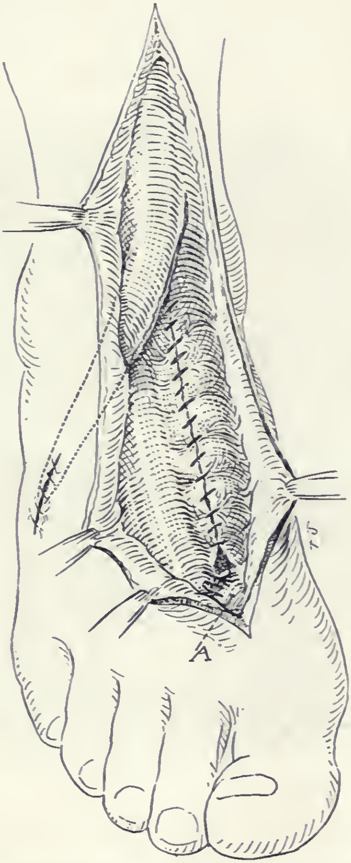

Fig. 409.—Extensor longus hallucis tendon transposed to outer side of foot. Skin closed with horsehair. Bed of tendon closed with continuous catgut: *A*, Suture of stump of extensor longus hallucis tendon to extensor of second toe.

We will now return to the first incision. We have two conditions to deal with, first, the incision through the annular ligament, and second, the proximal portion of the extensor longus hallucis tendon. We can fix the proximal portion of the extensor longus hallucis tendon which is attached to the toe by means of catgut to the surrounding tissue, burying it deeply. In this way the toe will be held up. A better way, however, is to suture it to the extensor of the second phalanx. (Sutures extensor longus hallucis tendon to the extensor of second toe—Fig. 409.) Now we will expect to have function of the large toe. That is important, since the large toe helps in propelling the body in walking. We do not want the toe to drop down, since in a short time it would bend under. We will now proceed to close the bed of the extensor longus hallucis tendon and annular ligament by a continuous catgut stitch (Fig. 409).

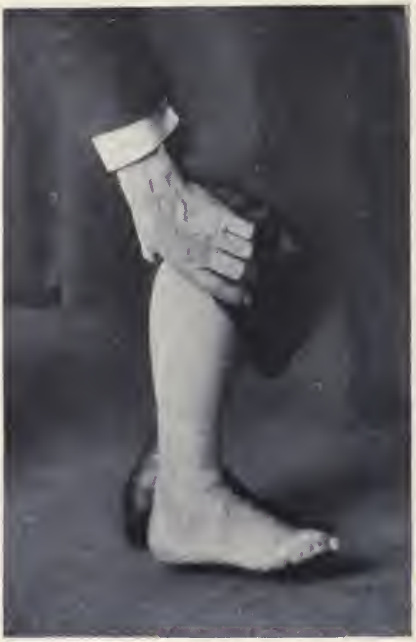

Fig. 410.—Same as Fig. 405 after operation. Wrinkling of the skin on outer side of foot showing contraction of the transposed extensor longus hallucis tendon.

We will close the skin with horsehair and keep the foot at a right angle for about four or five weeks.

Postscript.—The sutures were removed on the tenth day.

The skin healed by primary union. The skin over the insertion of the tendon looked as if there were some infection. The edges were, therefore, retracted and there escaped a drop of serous fluid, but no pus. This was believed due to necrosis and liquefaction of the surrounding tissue due to too much constriction. I was apprehensive that the tendon would loosen from its new mooring, so a silkworm suture was inserted through the skin, subcutaneous tissue, and tendon. Recovery was perfect. In the accompanying photograph (Fig. 410) a wrinkling of the skin can be seen, which is due to contraction of the transposed tendon, and can be traced to its insertion.

CLINIC OF DR. ALBERT J. OCHSNER

Augustana Hospital

BILATERAL GRITTI-STOKES AMPUTATION

Summary: **A patient with paralysis of both legs below the knees of fifteen years' duration, as the result of severe secondary anemia from duodenal ulcer and subdural hemorrhage. Technic of the amputation. After-treatment—method of teaching patient to walk.**

April 12, 1918.

HISTORY

The patient is a married woman aged forty-eight years. Her mother died twenty-five years ago of some growth; her father died two years ago of myocarditis. One sister and three brothers are living and well. She first entered the hospital fifteen years ago with the general statement that for several months before entering the hospital on May 1, 1903, she had suffered from symptoms indicating the presence of gastric or duodenal ulcer complicating chronic appendicitis. She was anemic, with a blood count of less than 1,000,000 red cells and she was markedly emaciated and extremely weak. She complained of increasing numbness of both feet and hands and an inability to see clearly. All of these conditions became worse from day to day, until first the lower and then the upper extremities became paralyzed completely and she became totally blind. Before this blindness occurred an ophthalmoscopic examination was made and capillary hemorrhages were discovered accounting for the clouding of her vision and her total blindness. Bladder and rectum were paralyzed and there was marked difficulty in respiration. There was severe pain in the extremities for a number of weeks.

Within one month after the occurrence of blindness the condition of the eyes again began to improve. Within three months after this her respiration became fairly normal and there was a slight restoration, first of sensation and later of motion in the upper extremities. These continued to recover, leaving some contractures of fingers, with necrosis of the skin over the ends of several fingers.

Sensation also returned over the entire surface of both lower extremities, but motion never returned in any of the muscles below the knees.

There has been continued improvement in her general condition during the entire period of fifteen years, until her sight is again perfect, sensation and motion down to the thighs including bladder and rectum are normal. There is still some muscle atrophy, which is marked below the middle of the thighs.

At present her only complaint is paralysis of the legs below the knees and an extreme hyperesthesia to touch, all other sensations being subdued. She says that time and dates are very hard to remember and mean little or nothing to her.

Previous Illness.—She had the usual diseases of childhood; typhoid at fifteen years of age and an appendectomy twelve years ago. She had another operation later, but does not remember just what was done.

Habits.—Good.

Menstrual History.—Menstruation began at fourteen years, regular twenty-eight-day type up to the time she had typhoid. Following this she had irregular pain attacks from three to five days preceding the period, but very little pain during the period. She has not menstruated since the second abdominal operation was done.

She has been married twice; has never been pregnant. Her first husband died of pulmonary tuberculosis; her second husband is living.

General History.—She has occasional headaches over the occiput which last two to three days. Appetite is fairly good. Hearing and sight are good. Bowels move only by enema. Urination is normal.

COMMENTS AND OPERATION

DR. OCHSNER (April 12, 1918): This is a very extraordinary case. She came here about fifteen years ago having had a continuous hemorrhage from a small gastric ulcer. When she came here she was practically depleted from the hemorrhage, her red blood-count being below 1,000,000. The blood was so pale that one could hardly get a hemoglobin reading. She also had a subdural hemorrhage, and as a result was paralyzed throughout her hands, arms, and legs. There was hemorrhage into the choroid, so that she was blind. The only organs that were not paralyzed were her heart and respiratory centers, so that she breathed a little

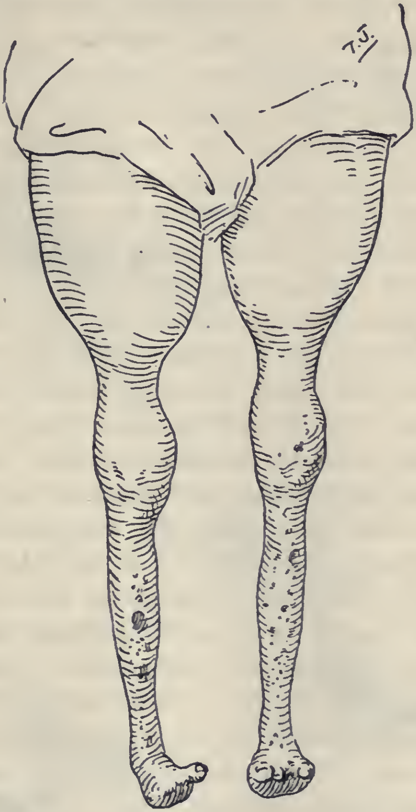

Fig. 411.—Appearance of legs before operation, showing marked atrophy from middle of thigh downward.

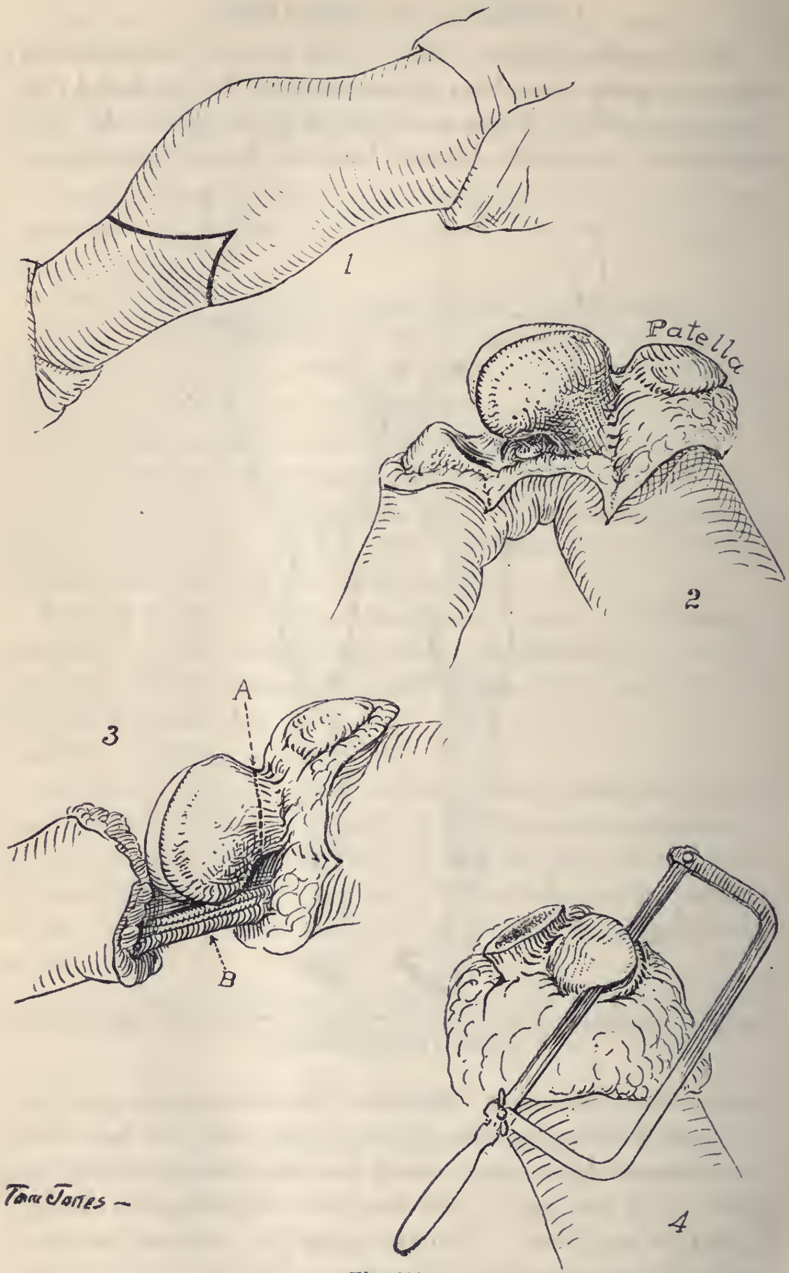

Fig. 412.

and the heart kept on beating. That was before the days of blood transfusion. If she came to us now in that condition we would immediately transfuse, giving her 600 c.c. of whole blood, and repeat that once a week.

Under treatment the blood became thick enough so that hemorrhage into the subdural space stopped. We put her on rectal feeding. As time went on the blood in the subdural space and the choroid was absorbed, so that the blindness disappeared and she began slowly to see. Then her hands and arms began to recover, as did the bladder and bowels. The condition has improved so that from her knees up her muscles are very well nourished, but the legs and feet are absolutely atrophic and there is scarcely anything left of them. Her toes began to drop off, so that we could snip them off with scissors. At the present time her legs are in very bad condition, being covered with ulcers because of the trophic changes, and it does not seem possible that after fifteen years those legs could regain their strength and nutrition, so that they would again become useful. It seems wisest to do an amputation through the knee joint and to utilize the patellæ, so that she can bear her weight on the patellæ. We propose to make a Gritti-Stokes amputation of both thighs, sawing through the condyles and then bringing the patellæ up against the condyles.

You see the condition of these legs. The thighs are in good condition down to the knees, but from the knees down they are absolutely useless (Fig. 411). You see the skin is perfectly good down to a point beyond the knee, so I believe we can make a typical Gritti-Stokes operation and that she will really have very good legs to walk on with the aid of artificial limbs.

We may be able to do this without the use of an Esmarch constrictor. We will be prepared to put one on if necessary. We will do the left leg first, making a long anterior flap and

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Fig. 412.—Gritti-Stokes amputation: 1. Line of incision to make the anterior and posterior flaps. 2. The joint exposed after section of the patellar ligament. 3. The patella reflected upward and the popliteal vessels and nerves exposed. Dotted line (*A*) is line of section of femur (*B*). 4. The vessels have been doubly ligated, the sciatic nerve resected as high as possible, and the femur sawed off just above the condyles. The patella is being sawed in two longitudinally.

cutting off the patellar ligament (Fig. 412, 1). Now we will try to catch each vessel as we cut it. There is too much bleeding on this side, so we will apply an Esmarch constrictor on the other side. The artery and vein are very thick walled.

I have made a long anterior and a short posterior elliptical flap, the anterior flap extending through the patellar ligament. Then I have divided all the structures down to the lower end of the femur. Then I have sawed the patella in two longitudinally, so as to produce a freshened surface. The femur was sawed off 6 cm. above the joint transversely (Fig. 412, 2, 3, 4). The patellar stump and prepatellar ligaments were then placed in exact apposition with the end of the femur and the edges of the ligament sutured to the periosteum in order to hold it in place (Fig. 413, 5, 6). The flaps were then sutured in place with interrupted catgut stitches, leaving no hollow space. The popliteal artery was tied twice with reliable catgut ligatures. The popliteal nerve was stripped a distance of 6 cm. above the point of severing the other soft tissues, where it was sectioned with a V-shaped cut. All superfluous fat was removed before the flaps were sutured.

The operation on the right extremity is carried out precisely in the same manner, in order that both extremities may be exactly alike.

This looks as though we had too much flap, but when it is healed it will be just enough. We did not have to use an Esmarch constrictor on either side. We are closing these wounds without drainage.

You will note how we apply the dressings. There is a large loose pad of sterile gauze over the end of each stump, but above the knee the bandaging is applied much more tightly. Pressure on an amputation flap under the conditions here present is liable to cause necrosis of the flap because of its impoverished circulation, hence our dressings are applied so as to produce absolutely no pressure (Fig. 413, 7, 8).

The usual objection to the Gritti-Stokes operation, because of lack of space for making a satisfactory knee-joint in the artificial leg, does not apply to cases in which both legs have been

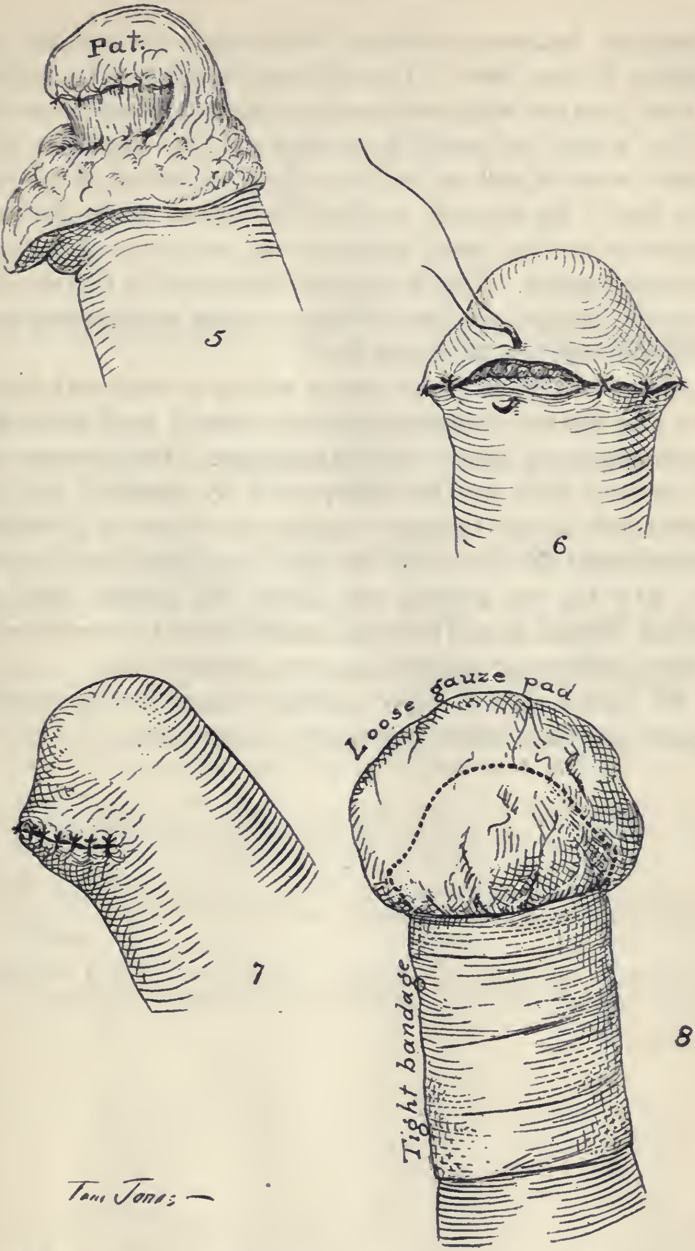

Fig. 413.—5. The patella sutured to the end of the femur. 6. Closure of flaps. 7. Final result. 8. Bandage applied very loosely over stump, but tightly around thigh. Dotted line shows relations of stump

amputated, because the artificial limb-maker can suit his convenience in these cases. The additional length will be uniform on both sides and will, consequently, not result in any deformity.

The stumps are perfectly rounded and the suture line is at a point where it will not be irritated by the socket of the artificial limb. By carefully padding this socket the patient will be able to bear her entire weight on the end of the stump with complete comfort. This is especially important in this case because this patient will have to learn to walk after having been confined to her bed for fifteen years.

After three weeks these stumps will be covered with stockings, and sockets extending half the length of each femur will be constructed of plaster-of-Paris bandages. These sockets will be removed daily and the stumps will be massaged, and the patient will be put through a systematic course of gymnastic training until she can stand and walk upon these sockets, and only after she has attained this ability will artificial limbs be secured, because it will be much easier for her to learn to walk on these improvised sockets than upon artificial limbs.

We have a right to expect primary wound healing of these flaps so that there will be practically no scar tissue.

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SURGICAL CLINICS OF CHICAGO

Volume 2 Number 6

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

ACUTE NECROSIS OF THE THYROID GLAND

Summary: A patient presenting symptoms of sepsis with signs of acute inflammation in the right side of the neck; diagnosis—difficulty of excluding thrombophlebitis of internal jugular; complete necrosis of right lobe of thyroid disclosed at operation; treatment by excision; after-history.

September 11, 1918.

I SHALL operate this morning on an unusual case of subacute infection of the thyroid gland, associated with symptoms very suggestive of a septic thrombus of a large vein.

This patient is sixty years of age. A month ago he was taken acutely ill with chills and fever, the temperature going up to 104° F., and a rather severe sharp pain in the right side of the neck, just above the sternoclavicular articulation. This area was also exquisitely tender to pressure. He had frequent recurring chills with high temperature for a number of days and then came to the hospital.

I found on examination a hard wooden-like induration just above the sternoclavicular articulation, which was exquisitely tender, not fluctuating, and seemed to be deeply situated.

We kept the case under observation for several days. He had a few chills with a high temperature. I could not make a diagnosis, so explored this area under local anesthesia, and found as I cut down on this mass that it was an inflamed thyroid gland, embedded in an edematous connective tissue capsule. There was no pus, and a cut section of the gland about here showed simply a round-cell infiltration. The incision was drained, and I gave him a favorable prognosis, stating at the time that it was an exceedingly rare condition, and one that I had seldom met with, namely, an acute infection of the thyroid gland.

Rather to my surprise, and very much to my disappointment, the man did not make a recovery. The severe chills ceased, but his temperature continued. There was very little suppuration from the wound, which was kept open and packed with iodoform gauze. In the bottom of the wound one could see a grayish-yellow necrotic looking tissue. The whole area remained tender, although the pain disappeared largely from the neck. Then his chills commenced to recur with high temperature, and I was inclined to believe that he had a septic thrombus of some large vein in connection with the first diagnosis of an infection. I have decided to make an extensive exploration this morning under a general anesthetic.

The patient is now etherized, and I shall make an incision parallel with the inner border of the sternocleidomastoid and expose this entire area thoroughly. I divide the skin and superficial fascia and the platysma and come down to the inner border of the sternocleidomastoid, which is pulled to the outer side. The sternohyoid and sternothyroid muscles are edematous over this inflammatory mass, and I find that it is necessary to divide them transversely. I now come down to a large yellowish necrotic mass, which moves with the trachea, and which is clearly the right lobe of the thyroid gland. It is embedded in an inflammatory capsule. The mass itself is very hard, and you see it is difficult for me to find a line of cleavage between this gland and the surrounding structures. By very careful dissection I now expose the upper pole of the thyroid gland and the superior thyroid vessels. I doubly ligate these and divide between. I now expose the lower pole of the gland, and ligate the inferior thyroid veins in the same way. With a good deal of difficulty I am now elevating the outer edge of the thyroid, exposing the posterior surface, and taking great care to hug the thyroid tissue in order to avoid injury of the internal jugular vein, which is in very close contact and bound tightly by this inflammatory areolar tissue to the gland, and, of course, I am very careful to avoid if possible the recurrent laryngeal nerve.

Continuing the dissection, I now ligate the inferior thyroid artery and elevate the gland from the trachea with which it is in very close contact, and from which I have to dissect it by very careful dissection with the knife, and I then come to the isthmus. I find that there is a very sharp differentiation between the right lobe, which is evidently necrotic, and the left lobe, which is quite normal. There is, in fact, no distinct isthmus. I simply turn out the necrotic right lobe and leave the normal left lobe. In the dissection I find a hard rigid cord at the outer border of the gland, which I am afraid may be the internal jugular vein filled with a thrombus. After further investigation, however, I think this is not true, and that this hard tissue is a mass of areolar tissue with some lymphatic glands. The internal jugular vein seems to be collapsed and does not stand out definitely, as in a normal dissection of the neck. I think, however, that this is due to the fact that it is compressed by the rigid areolar tissue which forms a capsule for the necrotic mass, and that it is not due to a thrombosis of the vein itself (Fig. 414).

The hemorrhage is now controlled, and we shall close this wound only partially, leaving about an inch in the center of it packed lightly with iodoform gauze for drainage.

After-history.—Immediately following the operation the temperature dropped to normal, and there has been no recurrence whatever of the chills and high temperature since the removal of the mass, showing that the chills and fever were not due to a septic thrombus in a large vein, but to the dead thyroid itself.

A microscopic examination showed large areas of necrosis, the condition being very much like that of complete infarction. The patient is going on to a rapid and complete recovery.

I have never seen a case of this kind before. The late Dr. John B. Murphy, in a personal communication, told me of a somewhat similar case which he had had in one of the sisters at Mercy Hospital, where there was an acute infection of the thyroid followed by a total destruction of the gland and later myxedema. The prognosis in this patient seems good, because the left lobe of the thyroid does not seem involved in any way.

I have handled a few cases with acute abscess of the thyroid gland, some of which have been colon bacillus infections, but I have never before seen a case of total necrosis of one of the lobes. I think the case should be reported because of its rarity, because of the obscurity of the diagnosis, and because of the remarkable and complete recovery obtained by a removal of the necrotic mass. It seems to me that, from a history of this case, the indication in a similar case in the future would be to make an immediate extirpation of the thyroid lobe, provided it

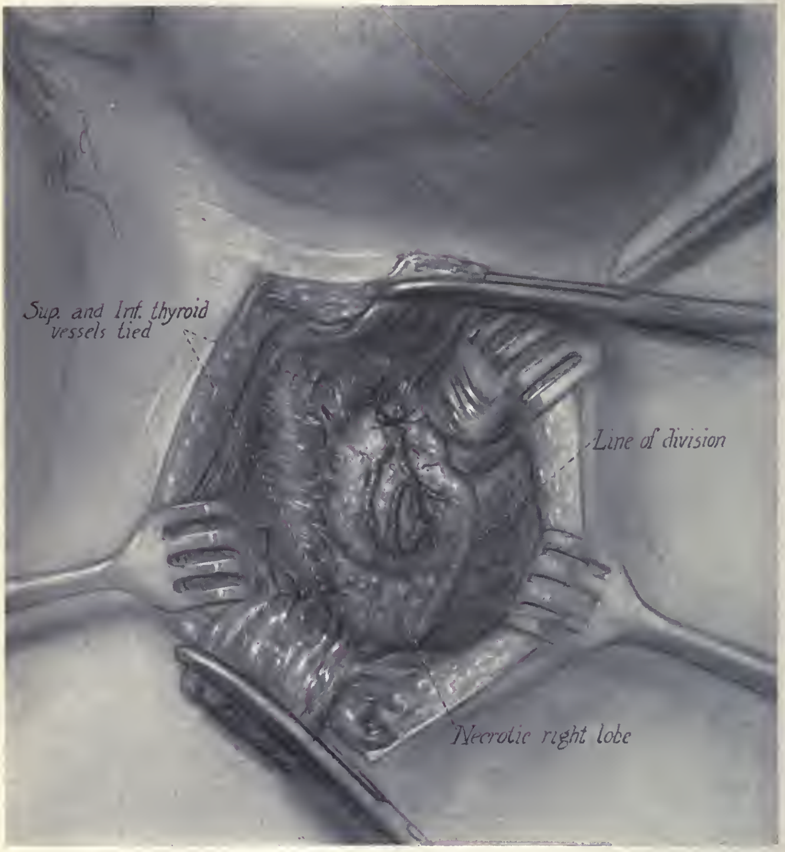

Fig. 414.—Resection of necrotic right lobe.

is limited to but one lobe. Where the process involves both lobes, I think the better plan would be to make a very wide exposure of the necrotic mass with drainage, with the hope that in the process of extraction of the necrotic tissue that some of the thyroid tissue might be retained, sufficient to prevent the development of a condition of myxedema.

SENILE GANGRENE—THE STEPHEN SMITH AMPUTATION AT THE KNEE

Summary: Site for amputation in cases of senile gangrene; technic of the Stephen Smith operation; results.

September 11, 1918.

The second patient I want to show you this morning is an old gentleman of eighty with senile gangrene. This man has been in the hands of a very competent surgeon for some months. The process developed in the great toe as a black gangrenous area, and remained stationary for some weeks. Finally a line of demarcation formed, and the toe was amputated by simply cutting it off with a pair of bone forceps. The pain, however, persisted and the wound refused to heal, and there has been a slow but gradual extension of the gangrene, so that it now involves the two toes next to the great toe and part of the anterior surface of the foot.

When he was first brought to me I opened up the area widely, and found pus extending under the integument for several inches, both on the dorsal and plantar sides. The infected area was widely opened and drained and there has been somewhat of an improvement, but no tendency whatever to repair. The old man is steadily going down hill, suffering great pain, and the problem is, What had best be done with him?

On examining the limb I find that the popliteal artery on that side is pulsating. There is marked atrophy below the knee, and I have decided to do what I believe best meets the indications in the case, a Stephen Smith amputation at the knee-joint, on the ground that if we make a lower amputation we are very apt to find that the anterior and posterior tibials at the division of the popliteal are blocked, and that we shall have sloughing in the flap. I have found, too, that no amputation in these cases has been as safe and as satisfactory and has given as painless a stump as a knee-joint amputation. I would not suggest that this be adopted as routine, but certainly in the

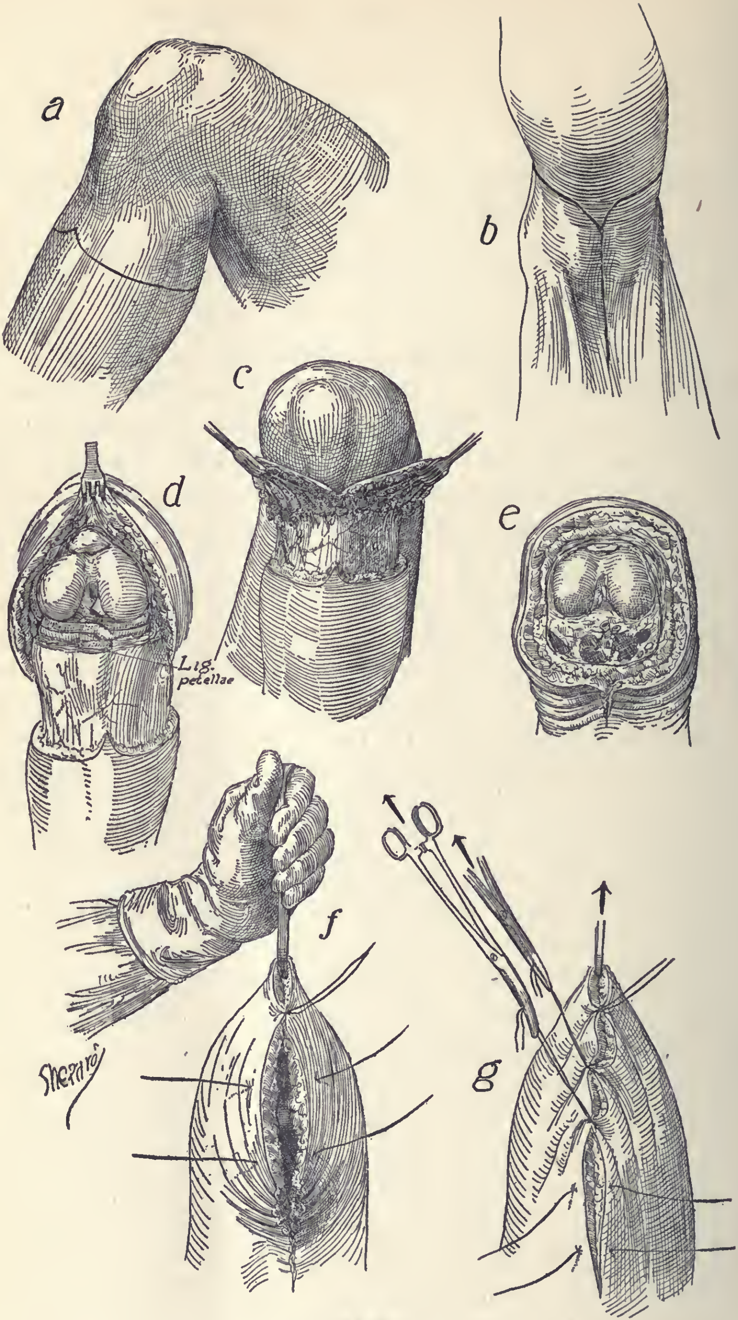

Fig. 415.

majority of cases of senile gangrene, where amputation is considered, it had best be done at the knee-joint by the Stephen Smith method.

Many of you who have come into surgery later will not remember Stephen Smith personally, although as an old man of ninety-five he sat on the platform two years ago in New York at the meeting of the American Medical Association, a fine looking, rugged figure, even at that age. Thirty years ago he was one of the most prominent American surgeons. He wrote an exceedingly instructive text-book on operative surgery, one of the best which I have ever read. He devised the operation of a bilateral skin-flap at the knee-joint, which has been known since that time as the "Stephen Smith amputation at the knee." I have employed it in a great many cases, and it is a most satisfactory surgical procedure.

On account of the interference with the blood-supply and the condition of the arteries we shall not employ a constrictor in this case. The patient is now etherized, and I shall proceed with the operation. I begin at a point just below the tubercle of the tibia, to which the ligamentum patellæ is attached, and make a bilateral skin flap (Fig. 415, *a*), consisting of skin and superficial fascia. The incision is carried posteriorly high up in the popliteal space (Fig. 415, *b*). Flexing the knee-joint, and with very little disturbance of the tissues, we are able to reflect these bilateral flaps and expose the ligamentum patellæ. This is divided and the knee-joint opened. As you see, there is but little bleeding from the superficial vessels, and this is controlled by artery forceps. I now divide the ligaments of the knee-joint, and then the extension of the anterior ligaments, extending from the ligamentum patellæ to the internal and external ligaments, and then the internal and external ligaments, and then the crucial ligaments in the joint. I am now

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Fig. 415.—The Stephen Smith amputation at the knee: *a*, *b*, Incision; *c*, dissection of hood over knee; *d*, disarticulation at joint; *e*, vessels tied; *f*, hood brought over end of femur and held up with hook. Preliminary sutures; *g*, folds in hood smoothed out for additional stitches by traction on clamped ends of sutures.

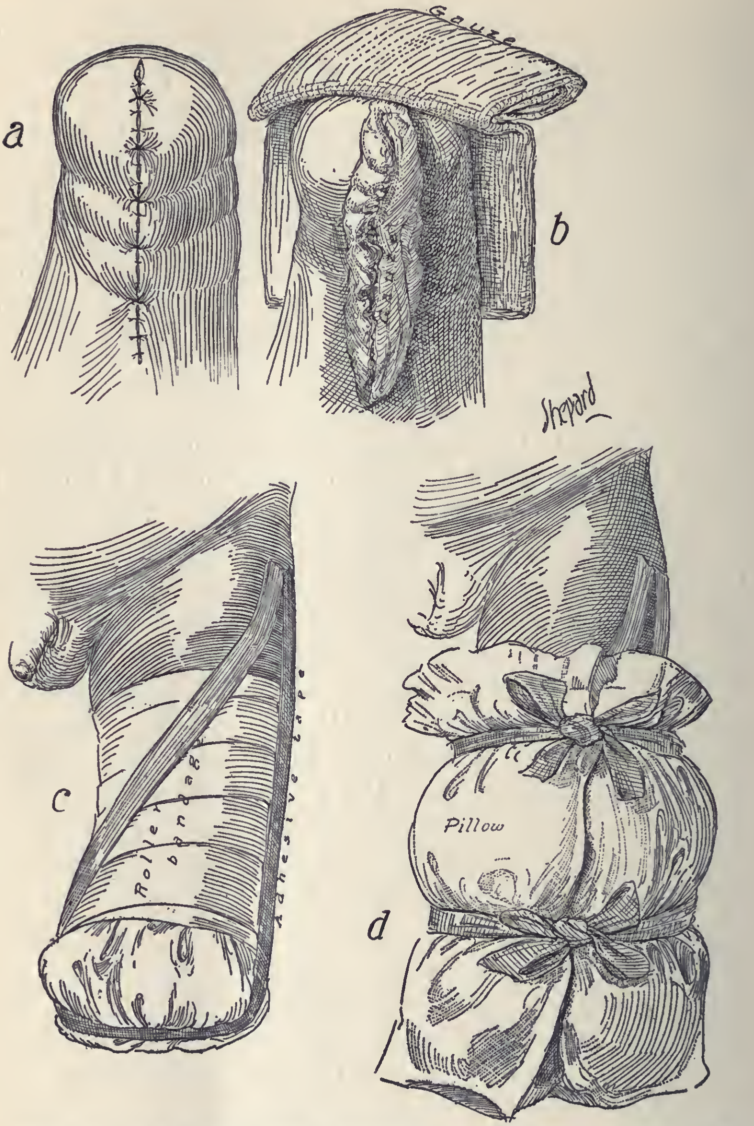

Fig. 416.—The Stephen Smith amputation at the knee: *a*, Wound closed completely with intermediate interrupted sutures; *b*, gauze pad placed over closed wound. End of stump covered with gauze fold; *c*, roller bandage placed and held in place by adhesive tape; *d*, pillow tied over stump.

able, by flexing the knee still further, to separate the tibia and the femur, so that I can readily feel and see the popliteal vessels. These are isolated with forceps. I clamp off the popliteal artery and popliteal vein, both above and below, and divide between. The artery is rather hard. Still it is by no means hopeless, and is in a condition which will probably enable us to secure fair wound healing without great risk of secondary hemorrhage. The internal and external popliteal nerves are now divided high up, and the soleus, gastrocnemius, and plantaris are divided transversely, just on the level of the femur, and the limb removed.

You will see how beautifully these two skin-flaps come together and form a cap over the knee-joint, the line of suture forming simply a straight line about 5 inches in length on the posterior surface of the stump. I shall not use any drainage-tube in this case, but will leave about $\frac{1}{4}$ inch at the upper end of the incision open without suture, so that any blood or synovial fluid may find ready exit. Now I wish you would notice that I am using great care in suturing the line of incision simply with rather fine black silk thread, interrupted sutures without any tension, putting them within $\frac{1}{4}$ inch of the cut and about $\frac{1}{2}$ inch apart, and closing the incision entirely. Those who have not tried the Stephen Smith amputation of the knee will be surprised at the beautiful stump that results, and they will be gratified to find the rapid wound repair that usually follows these operations. It makes also an exceedingly useful stump for an artificial limb, in spite of the fact that the contrary has been frequently taught.

After-history.—The patient made a splendid recovery from the operation. He had been taking a good many narcotics, and we were able to dispense with these within a few days after the amputation. There is usually a very definite and immediate relief from the pain of senile gangrene secured by this operation, and that was true in this case, the patient going on to a very satisfactory recovery without any gangrene of the flaps and with perfect wound healing.

UNDESCENDED TESTES

Summary: Development of the Bevan operation; surgical anatomy of undescended testicle—reasons for operative interference—selection of cases—the proper age; technic—difficult factors and how to control them—division of spermatic vessels necessary in not more than 10 per cent. of cases; results.

September 16, 1918.

I WANT to show you an operation this morning which we have developed in this clinic, and which is at this time of particular interest because of the number of cases that are coming to our notice on account of the mobilization of our man-power for war. The operation I refer to is that for replacement of undescended testes. The statistics taken from the military sources of different countries show that about one recruit out of five hundred who comes up for military service suffers from this malformation.

For a great many years no attempt was made to correct the deformity. In 1898 I first looked carefully into this subject, because I had brought to me for treatment a boy of about fifteen with double undescended testes. I found that very little work had been done up to that time. Max Schüller, in 1881, was the first to handle this condition at all logically. He devised the operation of dividing transversely the peritoneal process that extends from the general peritoneal cavity down to the tunica vaginalis. He found that this peritoneal process was the greatest obstacle to lengthening of the cord sufficiently to bring the testis down into the scrotal cavity. He did this, and then stitched the testes in the scrotum. Schüller's plan had the rudiments of a successful operative technic, but it was not sufficiently complete to be a successful operation and was not extensively followed.

In studying my first case I was fortunate in having a case in which replacement of the testes into the scrotum was comparatively easy and simple, because the testes were both below the external ring, easily palpable and somewhat movable, and with fairly long spermatic cords. I found that after I had divided the peritoneal processes transversely, as suggested by Schüller, that even in this simple case it was impossible to bring the organs down into the scrotum without tension until I had carefully torn all the shortened fibrous tissue in the cords with dissecting forceps, leaving simply the vas and its vessels and the spermatic vessels, practically stripping the cord of its fascial coverings. In this way I found that I could obtain sufficient length to enable me to make the replacement without tension. I then added to the operation several steps:

First, the making of a peritoneal sac around the testes and lower part of the cord of the tunica vaginalis by closing it with purse-string sutures. Then, instead of stitching the testes into the scrotum, after making a large pocket by blunt dissection I dropped the organs back into the scrotum, and closed the neck of the scrotum with fine catgut purse-string sutures, leaving just enough space for the cord, preventing in that way the organ being drawn back into the inguinal canal. My first operation was a distinct success and very satisfactory in every way, much more so than the results obtained in any of the cases reported in the literature up to that time.

I then began a careful study of this whole subject, and as my experience increased from one to a dozen or more cases, I found that many of the cases were difficult, and that the simple technic which I had employed in my first operation would not suffice. It was evident that, in order to obtain a good result, it was necessary to place the testes in the scrotum with no tension whatever, and that this proposition was fundamental. In the second place, it was fundamental that the blood-supply of the organ should be sufficient to carry on not only its vitality but its function. I soon found that in those cases in which the testes had never been out of the abdominal cavity, it was sometimes impossible by the first simple procedure that I had adopted to procure the necessary length of the cord, and in studying the subject I found that the shortened portion of the cord was the spermatic vessels, and that the vas and the vessels of the vas were practically in all cases of sufficient length. I began, therefore, in the intra-abdominal cases to divide the spermatic artery and vein, and to save the vas and the vessels of the vas, and secure the necessary length in that way. Before doing this, however, I satisfied myself by a review of my own varicocele work, and by a review of the experimental work on dogs, to determine the blood-supply of the testes, that there were two distinct and separate sources of blood-supply for the testicles, namely, the spermatic vessels, and the other vessels accompanying the vas, either of which were quite sufficient to maintain the nutrition and function of the organ. This could be demonstrated by the operations on dogs, and was confirmed by the fact that in my own varicocele work for a number of years I had simply saved the vas and the vessels of the vas and removed the spermatic vessels *en bloc* for several inches without any evidence of injury to the organs.

My experience with undescended testes now covers between 400 and 500 operations, and is sufficiently large to permit me to give you some pretty definite conclusions about this work. Before going into the technic of the operation, however, I want to discuss the deformity itself somewhat. First of all, the condition, of course, may be present either as a unilateral or as a bilateral one. The great majority of the cases are unilateral. Some of them are associated with hernia. Almost all of them have a potential hernia of the congenital type, in the sense that there is a continuous cavity from the general peritoneal cavity through the inguinal canal and into the peritoneal pouch external to the external ring. In this connection, I want to make plain one fact that was at first a surprise to me, because it was not in keeping with my preconceived idea of the situation. I had been taught that the process of the peritoneum, formerly the tunica vaginalis, was drawn down by the testis in its descent through the canal into the scrotum. As a matter of fact, in the several hundred cases which we have operated upon we have learned that the process of peritoneum extending through the canal into the scrotum or toward the scrotum precedes the descent of the testis. It is a budlet of peritoneum that grows out from the peritoneum, just as the arm-bud grows out from the fetus, or just as the vessels grow out into the upper and lower extremities, and it is not dragged down by the organ in its descent, but precedes the descent of the testis itself. This is shown by the fact that in the many cases on which we have operated, and in which the testis has never been out of the peritoneal cavity, we invariably find this process of peritoneum

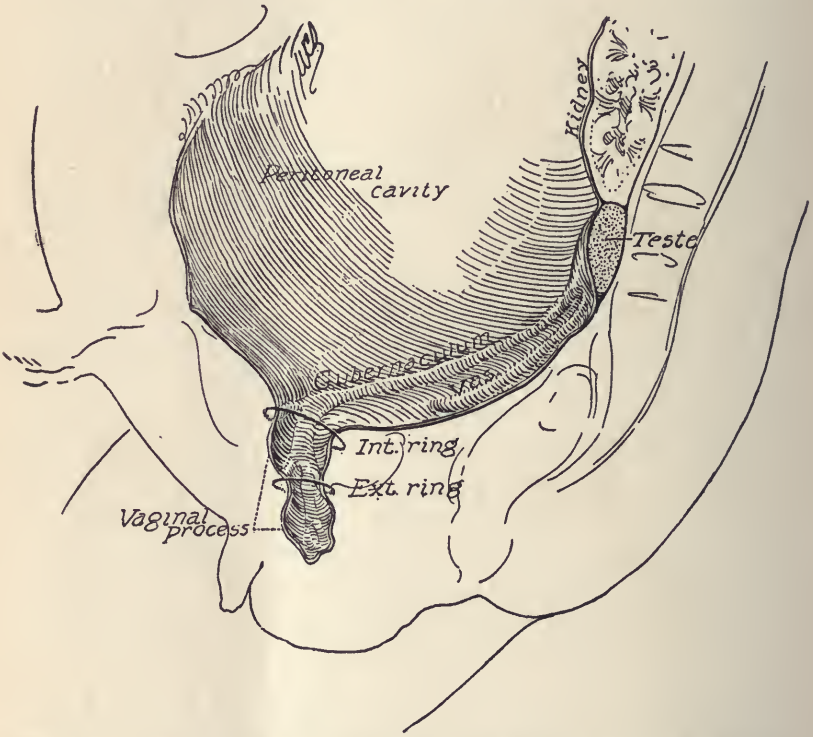

Fig. 417.—Diagram showing gubernaculum and vaginal process preceding descent of testicle.

extending through the canal and well down into the scrotum. Usually this process of peritoneum is of large size, much larger than the normal tunica vaginalis.

There can be no doubt but that the individual is better off with the organs in normal position than if they are in the abdominal cavity or left in the inguinal canal or at the external ring. In the inguinal canal or external ring they are subjected to trauma much more frequently than when they are in the normal position. This deformity, of course, is invariably associated with great risk of hernia. There is some evidence to show that undescended testes are more apt to be the site of malignant disease than those in normal position. Whether this is in any way associated with the displacement, or is due more to the imperfect and undeveloped condition of the structures of the organ, is an open question. There is associated with these cases, as in all malformations, a certain psychic element which must be considered. Individuals who are abnormal in any way, and individuals who have this deformity, are apt to be influenced

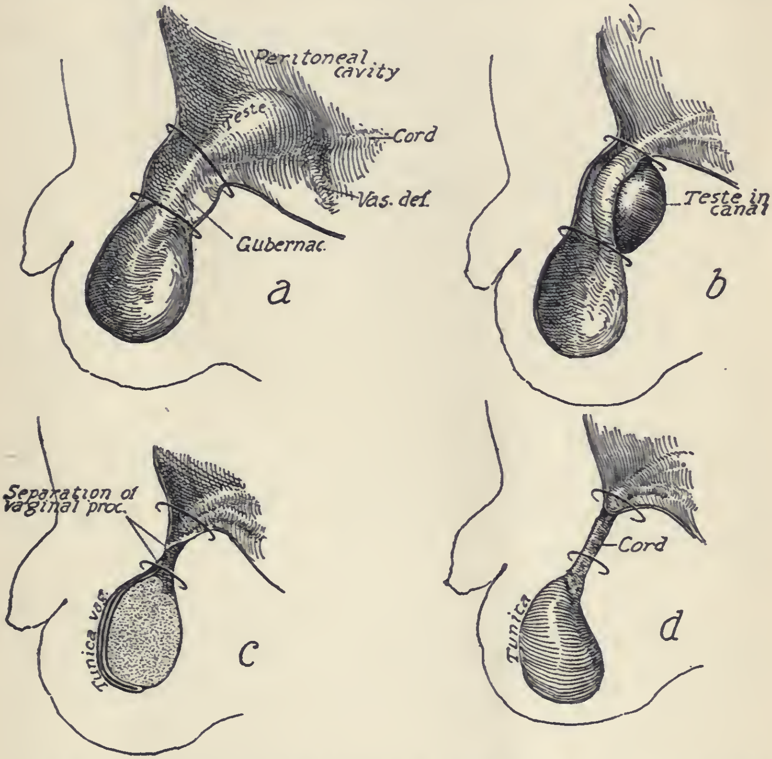

Fig. 418.—*a*. Testicle at inguinal ring. *b*. Testicle in canal. *c*. Section showing testicle enfolded by vaginal process. *d*. Complete descent of testicle with tunica.

by it, and especially if it is bilateral. Of course this element varies in different individuals. Sometimes this is a very important factor, and sometimes it is a matter of little moment.

In determining whether or not to do the operation for relief of this deformity we must be influenced by certain factors. First of all, it is always desirable to restore conditions to normal if possible. Second, the deformity of undescended testis is frequently associated with a hernia which cannot be comfortably controlled by a truss, but which can be cured at the same time that the operation is undertaken for replacement of the organ. Third, that these patients are much happier and more contented if they can be relieved of the deformity. Fourth, there is less risk from trauma or pathologic processes if the organ is in the normal position than there is if it is left in the abnormal position. Fifth, possibly the element of the greater risk of malignant degeneration should be considered, although I think this is not a very important point. Taking all these factors into consideration, my experience has led me to the conclusion that, inasmuch as the operation for undescended testis can be done as easily and with as little risk as the ordinary operation for the radical cure of a hernia, it should be generally done.

I have frequently been asked what age of selection is there for operation. I have operated at almost all ages. Where, however, we can choose, I should say that somewhere between twelve and fourteen years of age, or the period immediately preceding puberty, should be chosen. If, however, an infant of two or three years has an accompanying hernia with the undescended testis, that condition calls for operation even at that early age. Of course we have operated upon many adults with greater ease than we have operated on younger individuals and obtained very satisfactory results.

As we have developed our technic, I find that we can bring down into the scrotum without any tension practically any testis, even those that have never been in the inguinal canal. I am not now urging operation on all of these cases. Where a man comes to me, for instance, of twenty or twenty-five, with an undescended testis on one side and with a perfectly and completely closed canal on the other, where the testicle is strictly intra-abdominal and has never been engaged in the canal, has no associated hernia, and has never given rise to any discomfort or symptoms of any kind, I believe the best plan would be to let that patient alone, chiefly because he has one testicle in normal position and one in the abdominal cavity with a completely closed canal. The only reason for doing an operation in a case of that kind would be to control the psychic element in the case if it happened to be a matter of great moment in that particular patient. If that were the case, operation could be very properly considered. Wherever the testicle is palpable, and there is no distinct contra-indication, I believe an operation should be undertaken. We have had no fatality in the 400 or 500 cases which we have done. We have lost three or four testes in this large series, either from complete atrophy or necrosis due to a shutting off of the blood-supply. We have had a dozen or more cases where there has either been a distinct atrophy resulting from the operation or an unsatisfactory result, in that there was as a result of the operation simply a small indurated organ high up in the scrotum, a condition which is unsatisfactory both to the patient and the surgeon. In probably 95 per cent. of our cases operation has been very satisfactory and well worth while.

The patient upon whom I shall operate this morning has an undescended testis on the right side, which is quite palpable at the external ring.

The patient is now anesthetized, and I shall attempt to describe to you the details of the operation as we proceed. The incision made is exactly the same as that which we employ in operations for the radical cure of hernia. I am careful not to extend the incision down into the scrotum, but keep it well above the scrotal tissue at least an inch. I divide the skin and superficial fascia, and in the superficial fascia I divide the small arteries and veins, branches of the femoral artery and vein, that pass up above Poupart's ligament, at the lower angle of the incision the superficial external pubic, about the middle of the incision the superficial epigastric, and sometimes if the incision is prolonged the superficial circumflex iliac is divided (Fig. 419).

After dividing the skin and superficial fascia and clamping these small vessels, I expose fully the white, shining aponeurosis of the external oblique, and as I approach the external ring I come to the testis, which is surrounded by a large peritoneal sac. I very carefully separate this peritoneal sac from the surrounding areolar tissue. I now split the external oblique over the canal for a distance of about 2 inches. You will see that I am now able to bring the testis out of the incision and place it upon an abdominal pad. Making a little tension on the testis and the peritoneal sac surrounding it, I bring that part of the

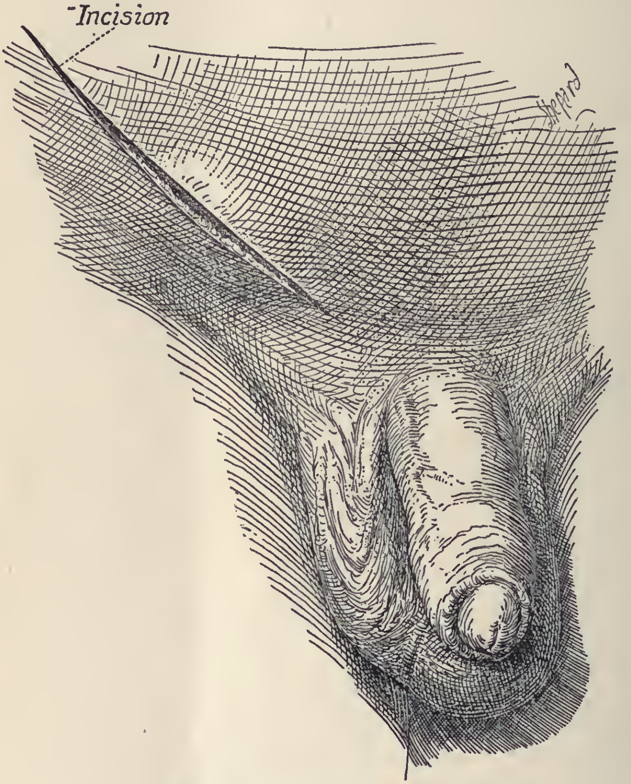

Fig. 419.—Incision over canal.

peritoneal process surrounding the cord well into view and free the cord well up to the internal ring.

The next step of the operation is to divide the peritoneal process transversely at a point ½ to ¾ inch below the external ring. This requires a delicate dissection, and we have developed some operative technic that is of value. I first split the vaginal process by a short incision, about ½ inch in length, parallel with the cord. I then place on this thin peritoneal process four small artery forceps, so as to be able to make the peritoneum tense. If it is difficult to dissect off the peritoneal structures of the cord I not infrequently take a fine hypodermic needle and syringe and inject some normal salt solution under the peritoneum, so as to lift it up from the cord, as you see I do now. This makes the separation of the peritoneal process much easier. The peritoneum is so delicate, being like tissue paper, that

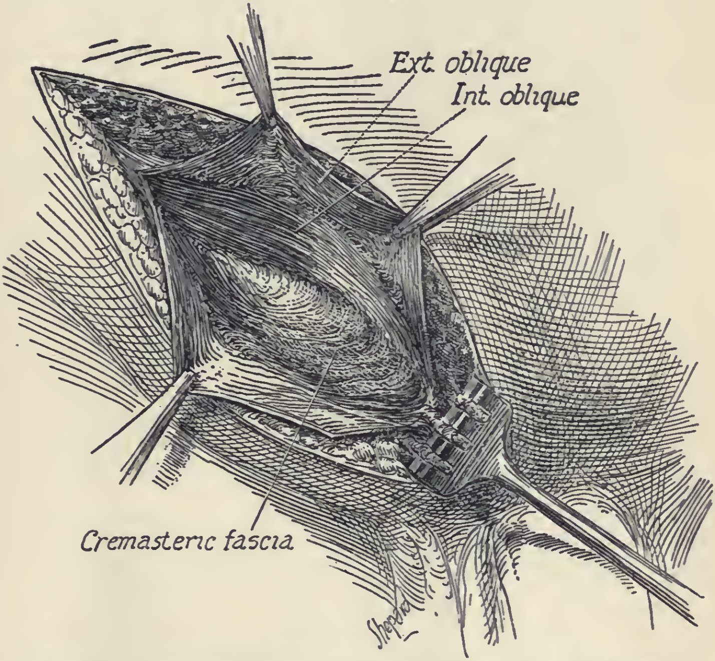

Fig. 420.—External oblique retracted and cremasteric fascia exposed.

you should make a very delicate and careful dissection. I have now completed the transverse division of the peritoneal process, and ligated the upper end of it that enters into the general peritoneal cavity with catgut ligatures, just as we do the stump of a hernial sac. Picking up the lower portion of the vaginal process with fine dissecting forceps, I strip it down from the cord,

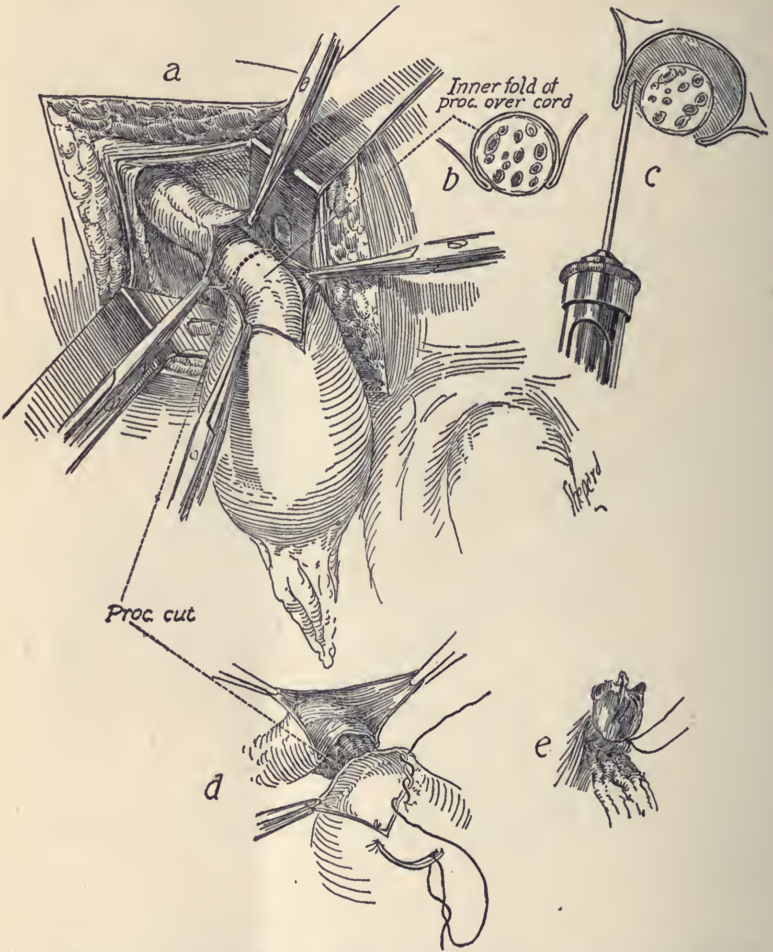

Fig. 421.—*a*. Vaginal process opened. *b*. Section of cord and opened process. *c*. Injection of water between process and cord. *d*. Vaginal process closed over cords. *e*. Proximal end of process transfixed and tied as in a hernia operation.

so as to expose 2 or 3 inches of the cord uncovered by any peritoneum. The lower part of the pouch is used to make a tunica vaginalis for the testis. This is accomplished, either with a purse-string suture or simply a running catgut suture closing the opening. As I lift up the testis and the cord there is still some tension, but I find as I examine it carefully that this tension, preventing a sufficient elongation of the cord, is due to some shortened fibrous bands, which I tear across now between dissecting forceps. I regard this as an important step in the operation, and it is one that should be thoroughly understood. One can with care divide and tear these shortened fibrous bands, leaving simply the vas and its vessels and the spermatic vessels, without interfering in any way with the essential structures in the cord. You will see that by this manipulation I have been enabled to free the cord for at least 5 inches, a length quite sufficient to place this testis in the scrotum without any tension whatever.

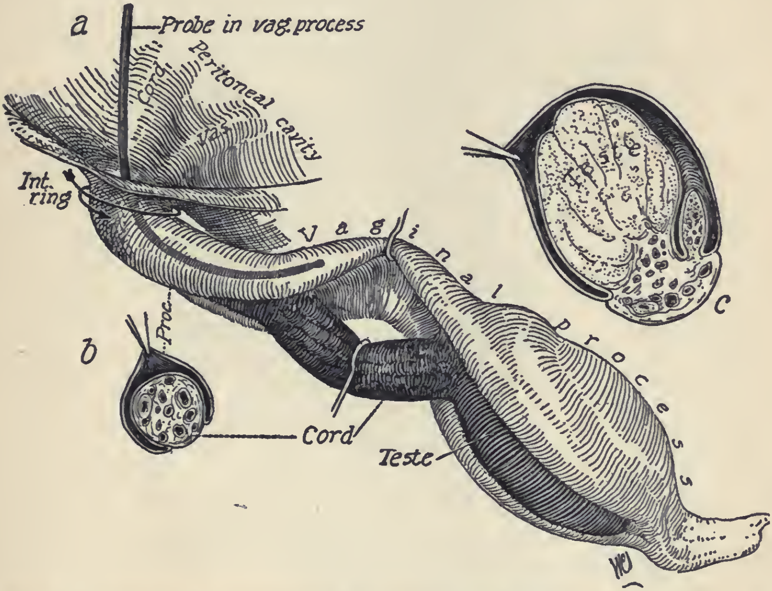

Fig. 422.—Schematic representation of vaginal process overlying cord and testicle.

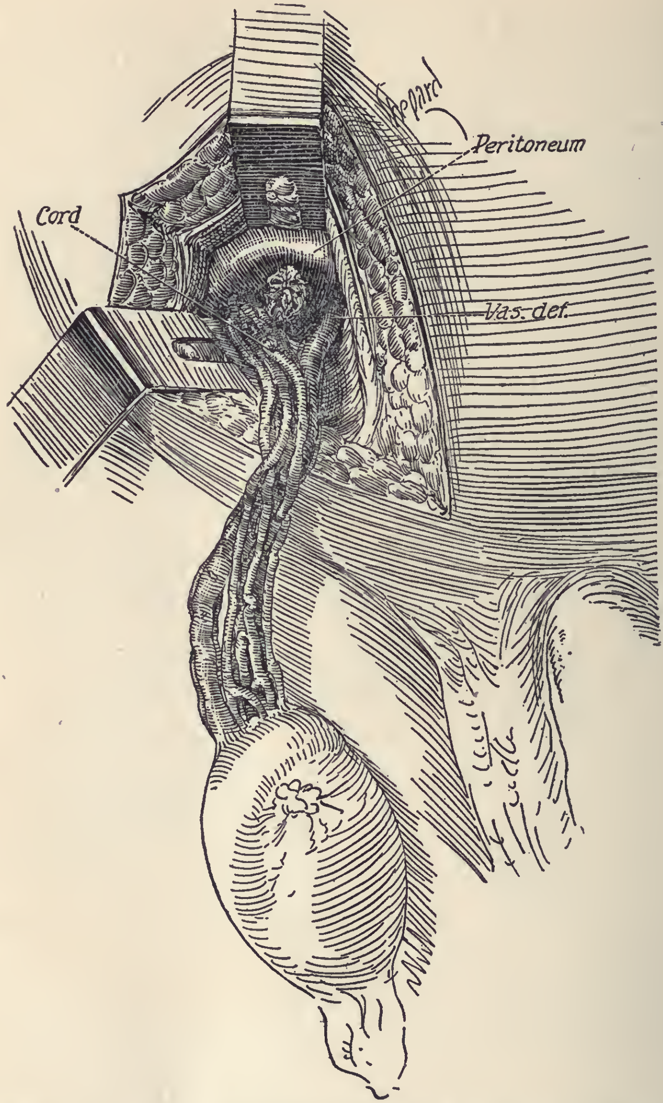

Fig. 423.—Cord freed from adhesions and ready for insertion into scrotum.

With the index-finger and a blunt dissection and by packing into it enough gauze I now make a pouch in the scrotum which is quite large enough to receive the testis without compromising it in any way. The organ is now placed in this pouch, and with a purse-string suture of catgut the scrotum is closed, this suture being one that simply goes through the superficial fascia, not involving the skin of

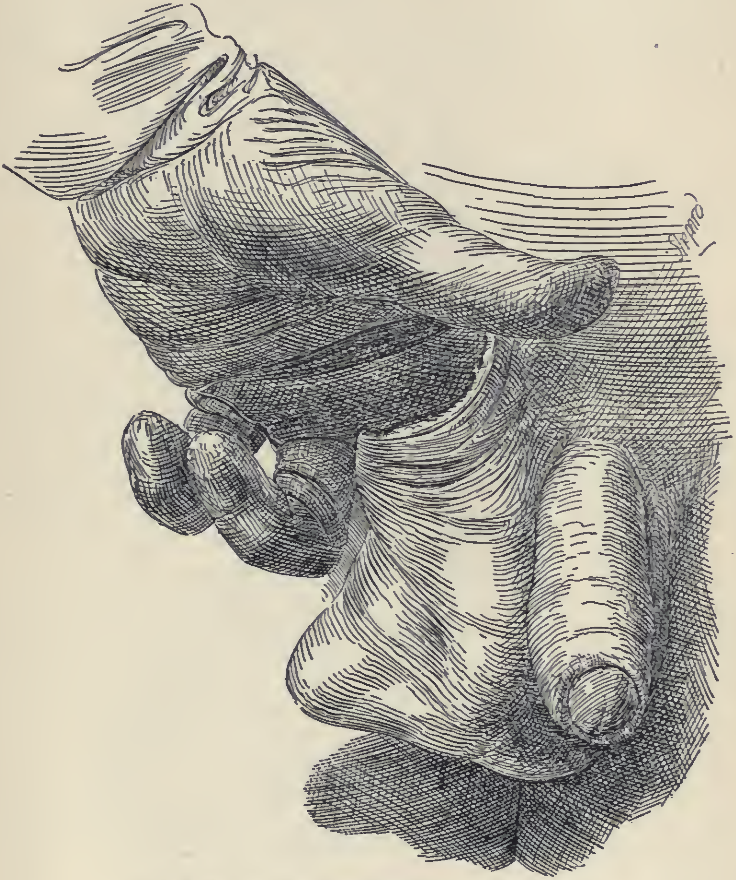

Fig. 424.—Scrotum stretched to receive testicle.

course. This prevents the testicle slipping back into the groin, and keeps it well down in the scrotum. The canal is now closed, not as in a Bassini operation, but with the cord deeply situated in the canal, and the transversalis and internal oblique are sewed to the shelf of Poupart's ligament, and the external oblique is then closed. The skin and superficial fascia are closed in the same way that we would close them in a hernial operation. You will see that the organ is now in the scrotum without any tension whatever, looking very much the same as on the other side.

This case this morning has been a simple one and not difficult in any way. Some of the cases are more difficult, and it becomes necessary to add a rather radical step to the operation in order to secure sufficient length of the cord. That step is a division of the spermatic vessels, retaining simply the vas and the vessels of the vas. I have been frequently asked how often we are compelled to resort to this procedure. I think I can say that in not more than 10 per cent. of the cases. We do not, however, hesitate to resort to it whenever it is necessary to secure suf-

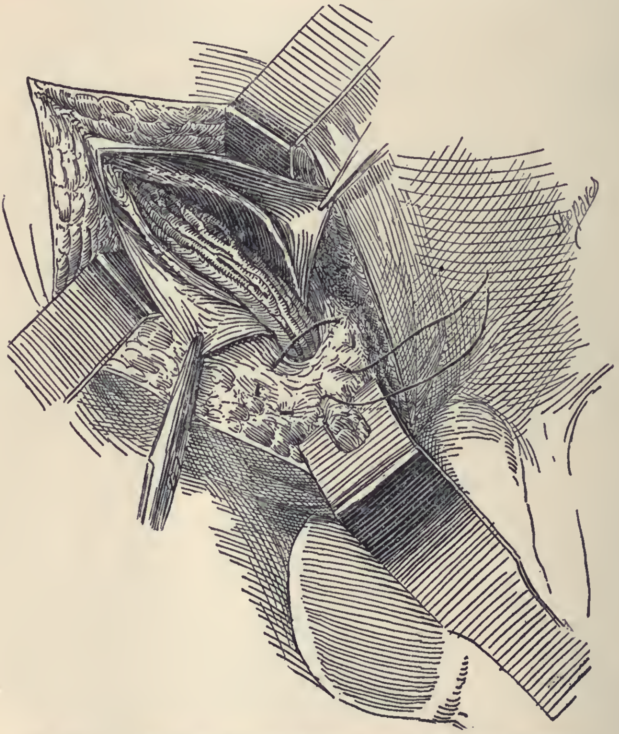

Fig. 425.—Testicle in scrotum and retaining sutures inserted.

ficient length to place the testis in the scrotum without tension. In these difficult cases we first of all do the technic which I have described to you this morning, the tearing across all the contracted connective-tissue fibers in the cord. If after this has been done it is found that the cord is not long enough, we then examine carefully and see what are the shortened structures.

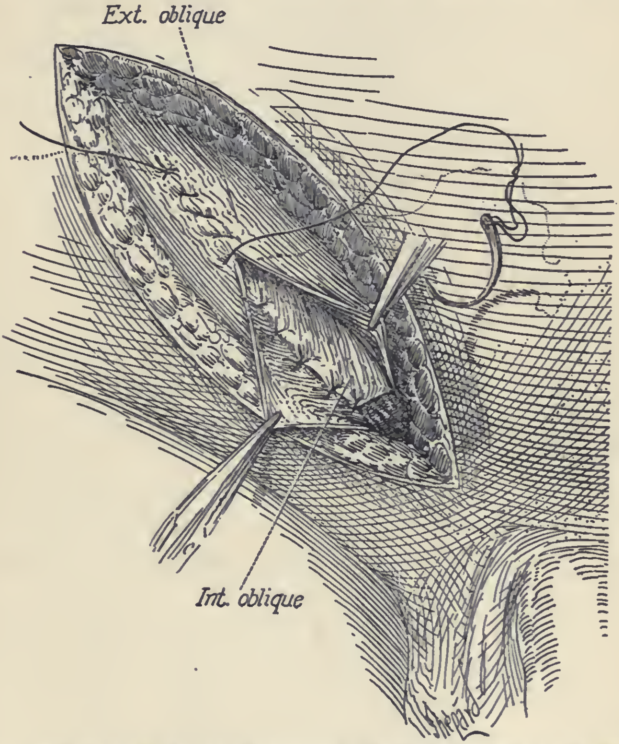

Fig. 426.—Closure: Internal oblique sutured to sheaf of Poupart's ligament over cord. External oblique closed with continuous stitch.

Almost invariably the shortened structures are the spermatic vessels. It is necessary to ligate the spermatic vessels in these cases, and we do this by a double ligature, dividing between them, and then unfolding the vas and its vessels gently and carefully until sufficient length is obtained.

We have, as I have already mentioned, lost some of these testes where the vessels have been sacrificed, but the percentage is small, and the prospect of maintaining good circulation and function are sufficiently good to warrant the procedure whenever it is found necessary.

There is a distinct class of cases where the testis is entirely intra-abdominal, and where the cord is so short that the testis cannot be brought down with sufficient prospect of maintaining a good circulation to warrant the operation, and in these cases I believe that the best plan is to leave the testis in the intra-abdominal position, remove the peritoneal pouch from the canal and that portion of it below the external ring, and close the canal tightly, as we would do in an inguinal hernia in the female. In our rather extensive experience these cases are rare, but they do occur, and good surgical judgment would demand that in these exceptional cases where the difficulty of having proper reduction and maintaining a blood-supply is so great we should not attempt it.

There is another group of cases of which we have found a few examples in our experience; that is, the group in which there is found a very rudimentary organ, so small that it is in general not worth while to attempt transplantation, some of these being no larger than a pin even in an adult. In these cases the vaginal process and the remnants of the cord structure should be removed as a hernial sac is removed, and the canal completely closed to prevent any possible hernia.

On the whole, the operation has seemed to me to have been one of the most interesting pieces of surgical anatomy that we find in the whole field of operative surgery. The skilful unraveling of this congenital condition, which enables the surgeon to accomplish in a half hour by good operative technic what requires weeks and months in the process of development, with, as a rule, perfectly satisfactory results, has furnished one of the most satisfactory examples of modern surgery.

I would like to emphasize the fact, that the technic must necessarily be difficult to one who undertakes it for the first time, especially without having had the opportunity of seeing a number of these operations done by one who has had experience with it. I would also like to emphasize the fact, from my observation of the cases that have been done by some inexperienced surgeons, that the operation has not infrequently been undertaken by men who have not fully understood the technic of the procedure, and who have not carried it out in all its details. I would like also to emphasize very strongly the fact that division of the spermatic vessels is but exceptionally called for, and is not at all an essential part of the operation which I have developed, that it has in our own hands not been necessary in more than 10 per cent. of the cases, and that it should not be done as a routine. On the other hand, wherever it is indicated it should be done and done thoroughly, on the principle that the basic idea of my operation is the necessity of placing the testis in the scrotum without any tension whatever. Care should be taken in the primary dressing of the case not to put on any considerable pressure over the groin; any pressure that might interfere with the circulation in the cord.

Following the operation there is not infrequently a good deal of discoloration of the scrotum on that side. It becomes black and blue and slightly edematous, but unless this is extreme no attention should be paid to it. Occasionally a hematoma has developed in the new scrotal pocket, which demanded relief by incision and the introduction of a small collapsible rubber drain or piece of gutta-percha tissue, but these cases have formed but a small percentage of the total.

CHRONIC VICIOUS CYCLE FOLLOWING GASTRO-ENTEROSTOMY

Summary: A patient complaining of loss of weight, distress after meals and the vomiting of food eaten the day before, subsequent to gastro-enterostomy for supposed duodenal ulcer; discovery of sharp jejunal angulation at operation; correction of deformity by anastomosis between proximal and distal jejunal loops; postoperative history.

The next patient which I have to show you is one of those complicated abdominal conditions which is made complicated by the uncertainty of the original diagnosis, and by the previous operative treatment that the patient has been submitted to.

The patient, a young woman of about twenty-three, the wife of an army officer who is now in France, has been an invalid for about three years. She was a rather nervous girl, complaining of more or less stomach distress, and was finally operated upon by a very competent surgeon, with the diagnosis of duodenal ulcer and a gastro-enterostomy performed. The patient had a good deal of abdominal distress before the operation, but this has been greatly increased since the gastro-enterostomy. She has lost a great deal of weight and is very nervous. She has distress after her meals, and has frequently vomited, sometimes vomiting very large amounts, 3 pints or more at a time, of food that was taken a good many hours before. The case has been analyzed by one of our best medical experts and has been gone over very thoroughly. There is no obstruction at the pylorus. There is no filling defect in the stomach or in the duodenum. There is apparently a marked dilatation of a large loop of bowel, as shown by the barium-meal in the fluoroscope.

The decision arrived at by my medical colleague has been that there is probably an obstruction of a loop of intestine from adhesions. She has been under medical management for a great many weeks, but has not improved, and I have been requested to make an exploratory, and determine if possible the cause of the difficulty and remove it if it is found feasible. There have been some attacks which are suggestive of gall-stone attacks in her case, but at the previous operation no evidence of gall-bladder disease was found.

The patient is now anesthetized, and we shall proceed to the exploratory operation. I shall make the usual midline incision, between the ensiform and the umbilicus. As I come down to the peritoneal cavity I find there are some rather delicate cobweb adhesions, which can be separated without difficulty and which do not bleed. I examine first the gall-bladder, and find that it is normal. There is no obstruction to the cystic duct. There are no stones to be felt in the common duct, as I place my finger in the foramen of Winslow. The duodenum is normal. There is no obstruction at the pylorus, and there is no evidence of any ulcer in the stomach. I now proceed to examine the gastro-enterostomy. I find a mass of adhesions that are fairly readily separated without requiring any dissection or ligature. I want to call your attention as I do this to the fact that there is a sharp angulation in the loop of jejunum which was employed in making the gastro-enterostomy. This angulation seems to me to be unusually sharp, and as I allow the stomach and the jejunum to fall into the ordinary place that they occupied in the abdomen, the angulation is very marked and evident. As I examine the gastro-enterostomy opening, I find that it is quite sufficient, admitting my two fingers. Before proceeding further I shall examine the pelvis. I find the pelvis normal, and nothing abnormal can be palpated in the general abdominal cavity.

What shall we do with this case? We can separate this loop of jejunum from the stomach, and leave her in the same condition that she was before the operation. It seems to me, however, that we can adopt a better procedure. I have had the opportunity of analyzing a number of very similar cases, and I am inclined to believe that her trouble is due to the sharp angulation at the gastro-enterostomy opening, making a condition very much like a vicious circle, with more or less dilatation of the duodenum and proximal portion of the jejunal loop. On account of this angulation, the food passes from the stomach freely through the pylorus into the duodenum, distends this part of the intestine and the proximal portion of the jejunal loop, and then runs back into the stomach without passing along through the intestine as it should. The indication here, it seems to me, is clearly to do a lateral anastomosis between the two arms of the jejunal loop, so that, as the food passes out from the pylorus through the duodenum and into the jejunum, it will then pass along into the distal loop of the jejunum without re-entering the stomach. I believe that this is the procedure which should be adopted, and I am rather hopeful that it will lead to her recovery.

The operation is done in the usual way, as you see, by putting a couple of intestinal clamps on these two loops and making an anastomosis about an inch in length by three rows of sutures.

After-history.—The after-history of this case was extremely gratifying. The patient went on to a good operative recovery, although for a few days there was some stomach distress and vomiting. Within a short time, however, the vomiting and stomach distress ceased, the patient's appetite improved, and she went on to a perfect and complete recovery. A few days ago I received a very gratifying letter from her, saying that she had entirely recovered, and was very grateful and very thankful for the operation.

Whether the original operation was necessary or not I cannot at this time decide. There may have been good and sufficient reasons for doing the original gastro-enterostomy, although, without pyloric obstruction or some other definite complication demanding it, I believe that these cases are best handled by proper medical management. There can be no doubt but that surgeons everywhere a few years ago did a great many unnecessary gastro-enterostomies, frequently in neurotics and frequently in individuals who had stomach distress from ulcer that might readily be healed by proper management, frequently that abdominal distress was the result of gall-bladder disease or cholelithiasis, and, of course, not infrequently of the gastric crises of tabes. I believe, however, that today in clinics where a large amount of stomach work is done very definite organic evidence is demanded before the gastro-enterostomy is performed. It is possible, of course, that in this case there was an ulcer of the duodenum which was cured by the gastro-enterostomy, and that it was so small that it left no evidence which I could find at this operation. There is a group of cases, however, of which this is an example, where a gastro-enterostomy is followed by a condition that might very properly be described as chronic vicious circle, which demands either the restoration of the stomach and bowel to the normal condition by undoing the gastro-enterostomy or a lateral anastomosis, such as we have done in this case.

PROSTATIC OBSTRUCTION

Summary: Patient giving a history of prostatic obstruction of unknown origin; attempt at instrumentation followed by chill, temperature, and complete anuria; suprapubic cystotomy—technic employed; subsequent history; advantages of a cystotomy under local anesthesia in this type of case; advisability of performing a two-stage operation in benign prostatic hypertrophy with obstruction; suprapubic route preferable to perineal in performing prostatectomy.

September 25, 1918.

I WANT to present to you this morning a patient who is in extremely bad condition from prostatic obstruction of as yet unknown pathology. He is eighty years of age, a veteran of the Civil War, and a man who has been in very good general health, considering his age, until the last few years, during which period he has been complaining of frequency of urination with some pus and blood in the urine. His attending physician felt that on account of his age he should be handled medically and without any surgical interference, although he had advised him to consult a specialist and have the bladder cystoscoped to determine the cause of the continued bleeding.

About two weeks ago he had complete retention. A genitourinary surgeon was called in, and found the bladder distended. The man was quite weak, in very bad general condition, and semitoxic, and the specialist felt that the best plan would be to simply relieve the retention with a catheter if this were possible. An instrument was apparently introduced into the bladder, but no urine was obtained. Following instrumentation the patient had a severe chill, rise of temperature, and apparently a complete anuria for about thirty-six hours. He became very toxic and flighty, and it seemed as though he would certainly succumb to the condition. The question of making a suprapubic cystotomy was discussed, and at first vetoed because of the very bad condition of the patient. I was then called in consultation, and agreed perfectly with what had been done for the case up to this time, but strongly urged a suprapubic cystotomy under local anesthesia for drainage, on the grounds that, although the man was in extremely bad condition, it was absolutely necessary to drain the bladder in order to secure any hope whatever of recovery. The attending physician and specialist both had thought very strongly of the possibility of carcinoma of the prostate or papilloma in the bladder as a cause of the obstruction, and the evidence that existed fully warranted such suspicions.

I have made a rectal examination in this case, and find a very large prostate, which seems from the evidence obtained by rectal examination to be not a carcinoma, but a large benign prostatic hypertrophy. I shall make a suprapubic cystotomy under local anesthesia.

The patient has been prepared, and I now infiltrate the integument and tissues in the median line, just above the symphysis, for a distance of about 3 inches with $\frac{1}{4}$ of 1 per cent. apothesin with a little adrenalin. I have assured the patient and the family that there will be little distress and little shock from the operation. I now make an incision about 2 inches in length through the integument, superficial fascia, and linea alba down on to a greatly distended bladder. On account of the urethral chill and fever that followed the attempt at catheterization before, I have made no attempt to pass a catheter into the bladder, wash it out, and fill it with boric solution, as we usually do in these cases. The abdominal wall, you notice, is exceedingly thin, and the bladder is very greatly distended, so that as I now come down to the surface of the bladder it looks like a blue, thin-walled ovarian cyst. To make sure of that I introduce a needle on an aspirating syringe and draw off, as you see, several drams of cloudy urine. I make a small incision now into the bladder, and you will notice a very free flow of cloudy urine. It is difficult for me to estimate the amount, but I should think that at least 3 pints escaped. You notice that the patient has had no sensation of pain whatever during these steps of the operation.

I take a No. 14 American size soft-rubber catheter and introduce it into the bladder for a distance of about $1\frac{1}{2}$ inches, and sew it in position with two fine catgut stitches. The small incision through the abdominal wall I sew up with two silkworm-gut stitches and cover the wound with a rather thick, stiff zinc-oxid paste, so as to protect the wound and abdominal wall from the irritating effect of the decomposing urine. You will notice that the urine smells very badly and is very strongly ammoniacal. The patient's condition is so bad that I will not at this time make an effort to explore the bladder and determine the character of the prostatic obstruction.

You can see at a glance that the patient is very toxic. His pulse is running about 44 per minute. His tongue is very dry and covered with a thick brown coat. He is so weak that he can scarcely move.

After-history and Comments.—The patient improved slowly after the bladder drainage. He had no reaction in the way of chill or increase in temperature. The bladder was washed out twice a day by introducing several times 6 ounces of warm boric solution through a glass funnel, just as is employed in giving rectal injections of normal saline solution. I think this is technically a very much better plan than using a syringe or ordinary irrigator. Four or five ounces of boric solution is left in the bladder after the last washing, so as to continue its mildly antiseptic action. Every effort was made by good nursing and careful feeding to improve the general condition of the patient. It was, however, a number of days before we could determine whether or not he would recover from the immediate effects of the intoxication.

Intoxication of this kind, I think, has been very properly described as "ammoniemia." I think that it represents a distinct clinical entity, the intoxication due to decomposing foul urine in these distended bladders from prostatic obstruction, especially when it is not associated with any general infection or any temperature. The condition reminds me of the general picture of sapremia, the intoxication that occurs from the absorption of a large infected blood-clot or necrotic mass without the associated picture of invasion of the living tissues.

Gradually the patient's condition improved. His vitality, however, was so low that there was a sloughing of the edges of the suprapubic wound for a distance of about $\frac{1}{4}$ inch around the incision. The tube was removed on the third day and the wound simply dressed with zinc oxid to protect the abdomen, and the dressings changed frequently, every two or three hours, in order to take up the escaping urine. At the end of about two weeks the patient had improved markedly, so that he could sit up two or three hours a day and could walk about room. The pulse increased to about 50. The operative wound cleaned up completely. I was able to make a digital examination of the interior of the bladder with my finger, which showed no carcinoma and no papilloma in the bladder, but a large prostate with a large median lobe that hangs over the internal orifice of the urethra like a valve, producing quite a complete mechanical obstruction. The patient continues to improve, and we are now confronted with the problem as to how to cure him of his prostatic obstruction, so that we can allow the suprapubic wound to close.

On account of his age and bad general condition I am not inclined to think of any effort at prostatectomy for a number of weeks, until the patient gets so that he can get up and about, and until his general condition improves so that we can undertake a suprapubic prostatectomy with a fair prospect of success. If the patient's general condition does not improve sufficiently to warrant removal of the prostate, it will be necessary for us to maintain permanent suprapubic drainage. We can do this with a rubber tube leading into a rubber urinal, which he can wear, or we might use one of the S-shaped silver tubes that Nicholas Senn introduced for the purpose of permanent suprapubic drainage. If this is employed, however, it should be removed frequently so as to prevent the formation of calcareous masses about the tube or in the bladder itself.

It frequently requires a good deal of experience and a good deal of judgment to determine whether we should undertake in a case of this kind a radical operation, or whether we should be satisfied with the results that can be secured by suprapubic drainage. This case presents several points that I think should be carefully studied. I want first to refer to the relative safety of draining one of these bladders by catheter or by suprapubic incision under local anesthesia. I think this point has not been sufficiently clear to most physicians who have had charge of these cases. Given such a clinical picture as is presented by this case, where instrumentation is difficult, I personally feel that a suprapubic under local carries with it very much less risk to the patient than difficult or continued instrumentation. Those who have had wide experience with urethral surgery know what a serious thing urethral fever is. I have personally seen several patients die from the mere introduction of a catheter followed by chill and fever and suppression of urine. This does not occur with suprapubic drainage under local. Under ordinary conditions, of course, the use of the catheter is a simpler procedure than suprabubic drainage. In an old septic bladder, where it is difficult to introduce a catheter, suprapubic drainage under local is undoubtedly a safer procedure, and it has the additional advantage that the surgeon can make a digital exploration to determine the exact pathology, and if later a suprapubic prostatectomy is needed this can be done with little difficulty by employing the same incision. That leads me to state that in these cases, where we have drained the bladder for prostatic obstruction and where the general condition warrants, within from ten days to three weeks after drainage we can make a suprapubic prostatectomy without the use of any instruments whatever, simply dilating first with the little finger the suprapubic fistula, and then the index-finger, and then with two fingers, and then bimanually with the gloved finger enucleating the prostate, very frequently under gas and oxygen anesthesia if there is a kidney involvement that contraindicates the use of ether. In these cases, too, we have simplified the after-treatment very much by not stitching in a tube in the bladder after the enucleation, but simply dressing the incision with zinc-oxid paste and copious gauze dressings, changing them sufficiently frequently to pick up the urine.

In connection with these suprapubic operations under local anesthesia, I would like also to call your attention to the fact that this technic eliminates almost completely the old plan of emptying the bladder with a suprapubic trocar, as the suprapubic cystotomy under local is very much safer than the use of a trocar and very much more satisfactory, because of the opportunity it affords of ascertaining the condition of the interior of the bladder. I would like to advocate this suprapubic operation under local instead of the employment of a permanent catheter introduced through the urethra for drainage, which

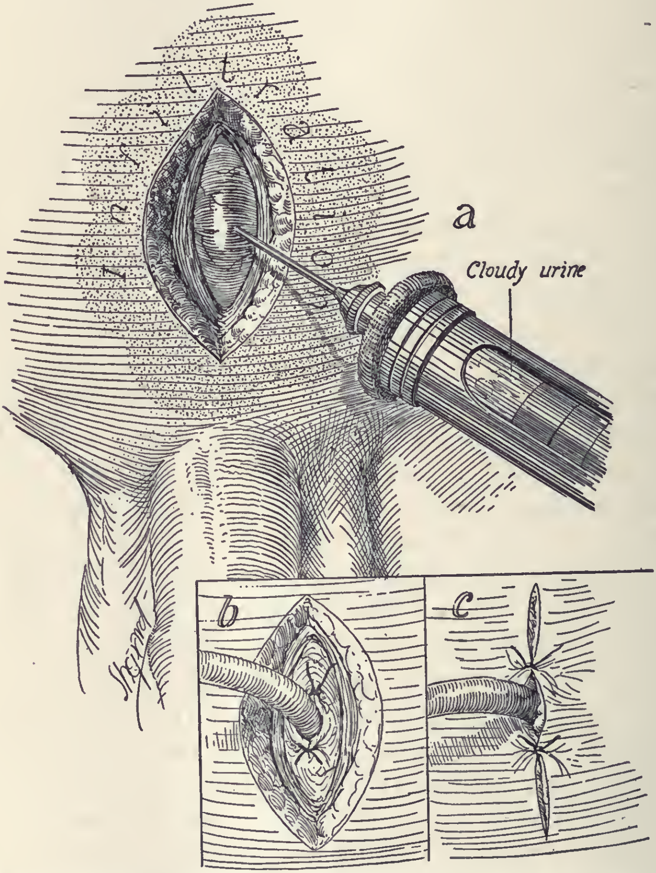

Fig. 427.—*a*, Incision over bladder; *b*, bladder empty—catheter sutured in position; *c*, skin closure of wound.

apparently is the choice of a number of surgeons in a picture of this kind. I am firmly convinced from my experience that the use of a permanent catheter is ill-advised, is dangerous, and should be discarded in almost all cases for the safer technic which I have described.

I should also like, in this connection, to call your attention to the fact that in benign prostatic hypertrophy with obstruction, where there is sufficient sepsis and toxemia to markedly lower the resisting power of the patient, that before prostatectomy is undertaken the patient should be relieved of that sepsis and toxemia by this plan of suprapubic drainage. Certainly, since we have adopted this two-stage procedure in our complicated cases our results have been very much more satisfactory, and this plan has reduced very markedly the mortality in a large series of prostatectomies.

I cannot dismiss this case without also impressing upon you what to my mind is always perfectly clear, that the normal and best method of doing prostatectomy is by the suprapubic route. There may be a few proper exceptions to this rule, but anatomically there can be no doubt that the fibro-adenomas developing above the line of the ejaculatory ducts, which produce for us the ordinary picture of an enlarged prostate with obstruction, can be removed much safer, with less risk of injuring the musculature and blood-supply and nerve-supply that have to do with continence, and with less risk of injuring the rectum by the suprapubic route than by the perineal route.

RUPTURE OF THE URETHRA

Summary: Patient giving a history of fracture of the pelvis with rupture of the urethera; development of a perineal abscess; operation—external urethrotomy by perineal route; plastic repair impossible in this type of case—after-history; importance of correct management of these cases from the beginning.

The second case that I want to present to you this morning is also a urethral case, but of a very different origin. This patient is a boy of eighteen, who was working on the railroad and was crushed between two freight cars, sustaining a fracture of the pelvis with a rupture of the urethra. This was followed by retention of urine. The attending physician attempted with instruments to draw off the water, and succeeded several times. It then became very difficult, on account of the ruptured urethra, to pass the catheter, infection occurred, and he was compelled to do a suprapubic drainage. Later a large perineal abscess developed, and he comes to us now very septic and in an extremely bad condition, with a huge abscess in the perineum. The suprapubic wound is now merely a fistula. The indication, it seems to me, is perfectly clear here, that is, to do an external urethrotomy, evacuating the pus in the perineum, and to introduce a good-sized rubber tube into the bladder for drainage. The perineal route here is demanded instead of the suprapubic route, first, in order to provide drainage for the perineal abscess, and, in the second place, so that we can handle the ruptured urethra properly.

The patient is now anesthetized with ether. I make a median incision about 3 inches long in the raphé of the perineum, and open at once into this huge stinking abscess. The pus is mopped out and the cavity irrigated with boric solution. I now pass a sound through the urethra down into the perineum, but I cannot pass it into the bladder. I cut down on the point of the sound in the urethra. I now take a small grooved director, holding the edges of the incision apart, and attempt to

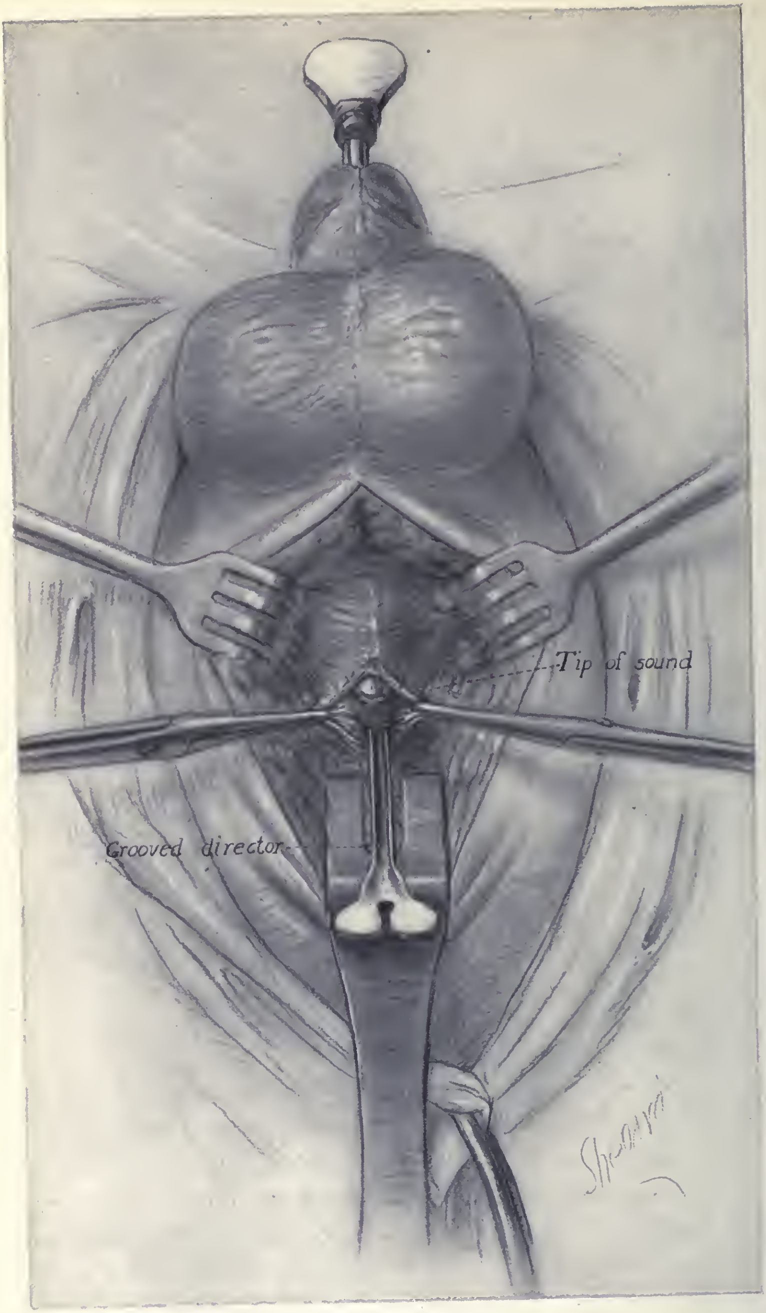

Fig. 428.—Grooved director introduced into posterior urethra and bladder.

find the proximal end of the ruptured urethra. Following the raphé of the urethra, I fortunately introduce the grooved director into the urethra and into the bladder. Along this grooved director I now pass a closed pair of artery forceps. I open the blades and dilate the urethra gently, so that I can introduce my little finger into the bladder. I take a rubber tube about the size of a No. 16 American soft-rubber catheter, slip it through the urethra into the bladder, and stitch it into position with a silkworm-gut suture, which goes through the edges of the skin and through the rubber catheter, preventing its extraction from the bladder. I pack some iodoform gauze lightly around

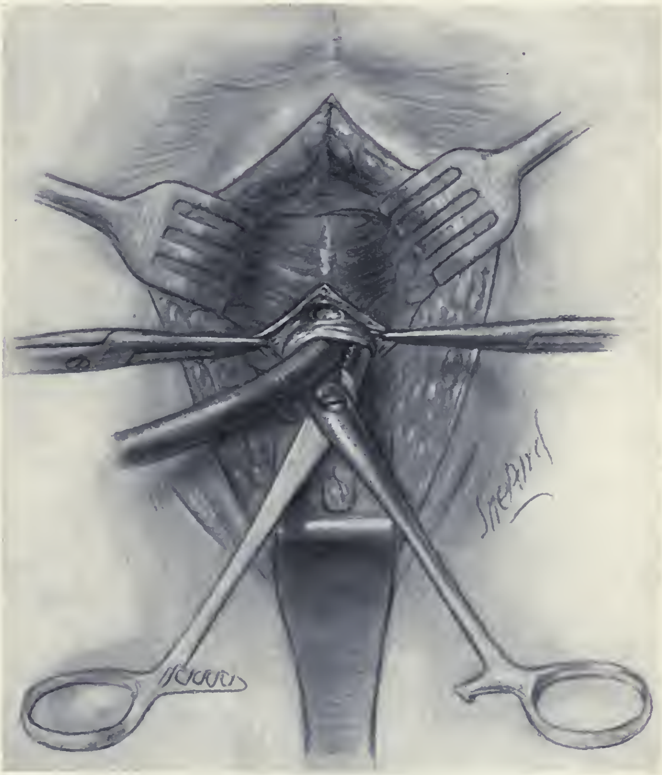

Fig. 429.—Blades of artery clamps opened, catheter introduced.

this tube and in the cavity of the abscess. The two bleeding points, which I pick up with artery forceps, I ligate. The rest of the hemorrhage is of little importance and is controlled by gauze pack.

After-history and Comments.—The patient's condition immediately improved after evacuating the abscess. The temperature came down within thirty-six hours to normal. The pain disappeared, and the boy went on to a rapid recovery. In the after-management of the case it became, of course, necessary to maintain a large caliber of the injured urethra during the process of wound repair, so as to avoid a resulting

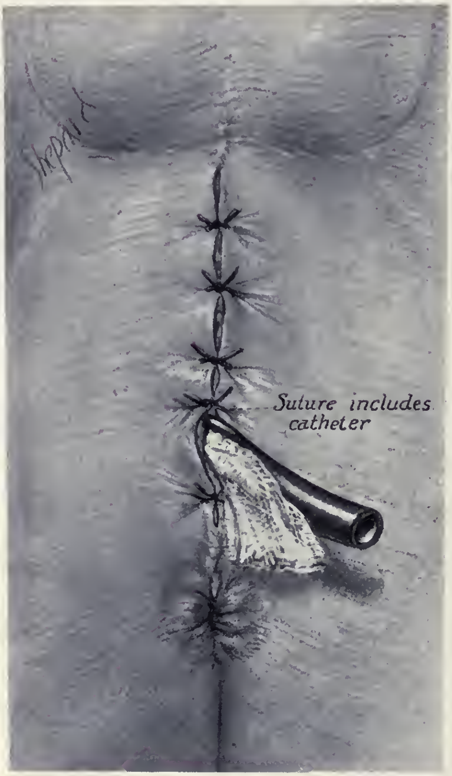

Fig. 430.—Closure—catheter sutured to edge of skin.

stricture. Within about ten days after the perineal operation the suprapubic wound closed completely. The rubber tube in the perineum was removed on the fourth day, and on the eighth day, under gas anesthesia, I very carefully passed some steel sounds through the external urinary meatus, and without using any force followed the urethra into the bladder. I then passed some larger sounds until I had reached a No. 30 French. This careful sounding was repeated twice a week until the perineal wound had closed completely. We had in this way maintained a good-sized caliber through the urethra during the process of wound repair.

In cases of this kind it is, of course, impossible for a surgeon to do any plastic repair of the urethra. One must be satisfied with maintaining by sounds a continuous canal through the ruptured urethra and injured soft parts outside of this until wound repair is complete, and until this canal becomes lined with mucous membrane, which creeps over the granulation tissues of the canal from both the proximal and distal ends of the urethra. Of course this is necessarily true in cases of this kind, where there has been a very extensive infection with abscess formation. My impression is that it is true, as a rule, in the ordinary case of ruptured urethra, where there is no extensive infection and abscess, that efforts at plastic repair and accurate suture of the ruptured urethra are of little value.

I would like to emphasize the importance of handling these cases of fractured pelvis with ruptured urethra correctly from the start. There are, of course, a few cases in which it is not necessary to do an external urethrotomy, where the rupture is not very extensive, and where the case can be handled either with a continuous catheter or with intermittent catheterization. The rule, however, is that external urethrotomy is necessary and is much safer for the patient. Certainly, wherever in cases of this kind it is difficult to pass a catheter, and where evidence of infection develops, the surgeon should not hesitate to at once proceed to do an external urethrotomy, securing in this way free exit of urine and good drainage, and securing the necessary permanent result by carefully passing sounds of large caliber during the process of wound repair, until we have secured a urethra of such caliber that the resulting scar-tissue will not produce stricture. Of course these cases should be looked after carefully, and should be told to report to the surgeon once or twice a month for at least a year after the accident, and have the urethra dilated if necessary in order to prevent serious contraction.

CLINIC OF DR. THOMAS J. WATKINS

ST. LUKE'S HOSPITAL

PERINEORRHAPHY—A SIMPLE AND EFFICIENT OPERATION

Summary: Principles of operation; technic employed—denudation—hemostasis—closure of wound; reasons for using this method of closure; advantages of approximating fascial surfaces and of burying the sutures.

THIS is a short paper upon an operation which is not generally well done. The technical difficulties are few.

Principles of the Operation.—(1) Repair of the rectocele which is generally present (Fig. 431).

(2) Restoration of the posterior vaginal wall for pelvic support.

The rectocele is a hernia, and should be treated as such. Restoration of the pelvic structures in the posterior vaginal wall consists chiefly in shortening the levator ani muscle and its associated fascias. To mention the other muscles adds confusion without elucidation of the subject.

Technic.—(1) *Denudation.*—This may be done by blunt dissection or by removal of the mucosa in strips. Blunt dissection is preferred in cases of very large rectocele. Otherwise denudation in strips is advised. The extent of the denudation is shown in illustration (Fig. 432). It should extend sufficiently high to enable the "purse-string sutures" to include the upper border of the levator ani muscle and fascia on either side, but should not extend so high as to excessively narrow the vaginal canal.

(2) *Hemostasis.*—This should be carefully accomplished by fine ligatures and sutures.

(3) *Closure of the Wound.*—The hernial opening in the case of a rectocele is closed by one or more circular sutures, which unite the levator ani muscle and fascia and the triangular liga-

ment. Figure 432 distinctly illustrates the triangular ligament. This is an exact drawing made during operation. The ligament, however, is broader in this case than usual.

(*a*) The first suture, as shown in Fig. 433, enters at the upper border of the levator ani muscle and fascia, and emerges at the upper border of the triangular ligament, and is then carried through the base of the triangular ligament for its entire width. It then passes through the muscle and fascia at a corresponding place on the other side. It is not tied at this time.

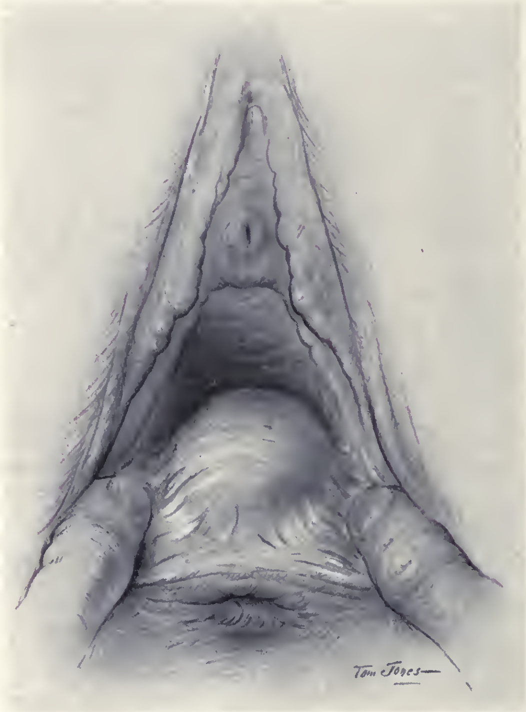

Fig. 431.—Rectocele—exact reproduction.

(*b*) *Closure of the Sulci on Either Side.*—This is accomplished with one or two interrupted sutures in either angle, as shown in Fig. 434.

(*c*) *Emmet's "Crown-stitch" Suture.*—This is placed as shown in Fig. 434, and is for the purpose of insuring complete closure of the upper part of the wound. It is a submucous suture which becomes entirely buried.

(*d*) The purse-string suture is now tied and cut. It completely closes the hernial opening of the rectocele, as shown in

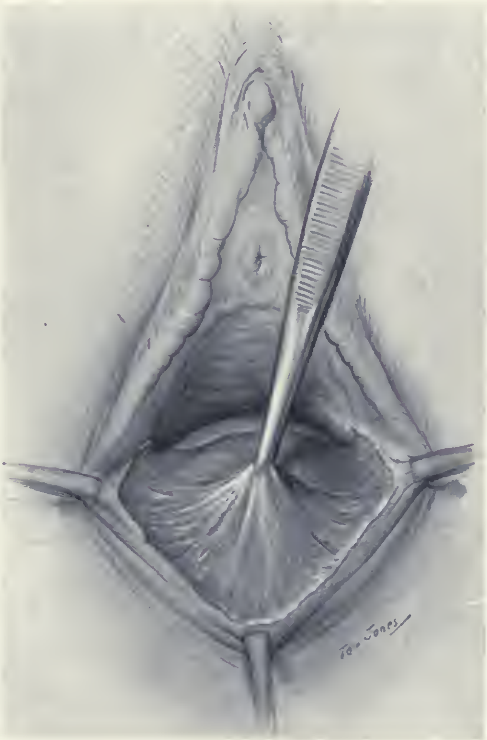

Fig. 432.—The triangular ligament is suspended at the median point of its base. This suture is not tied until later.

Fig. 435. Its knot is also buried when the "crown-stitch" suture is tied, as shown in Fig. 435.

(*e*) A second purse-string suture is now inserted parallel to the first one, but more superficial, as shown in Fig. 435.

(*f*) A third purse-string suture is now inserted, as illustrated in Fig. 436. When this is tied there is complete closure of the wound, as shown in Fig. 437. No sutures are visible, as they are all placed either underneath the skin or mucosa.

Comments.—The placing of the first purse-string suture has to be adapted to the individual case as to the amount of tissue included on either side, and as to how far anteriorly the points of entrance and exit are placed on either side. It should be placed as far anteriorly and passed as deeply as is consistent with its being tied without much tension upon the knot. Its tying quality should be tested, so that it can be replaced if necessary before any additional sutures are inserted.

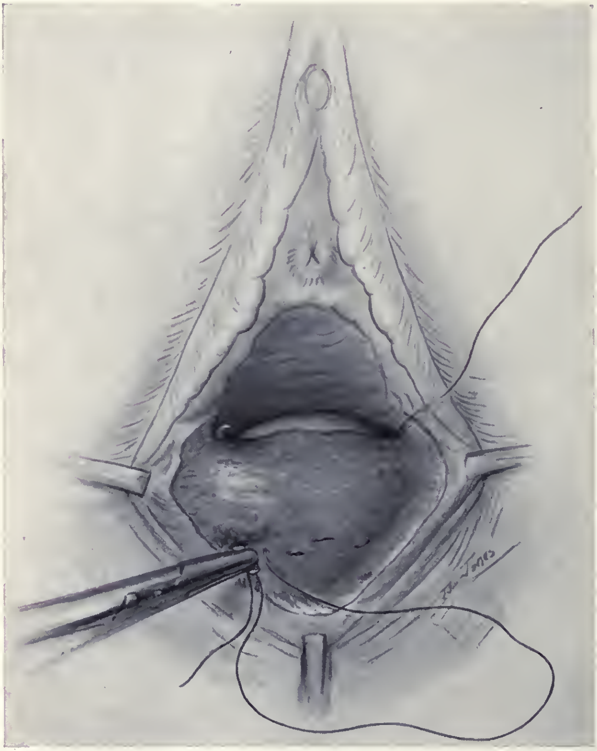

Fig. 433.—The first purse-string suture has been carried along the base of the triangular ligament and the needle is emerging upon the right side.

The oblique placing of the sutures is important, as with the tying of each successive suture the perineal body is rolled forward and inward. The amount of suture material employed is consistent with the size of the wound closed. Not much suture material is required, as the wound is never very large except when stretched.

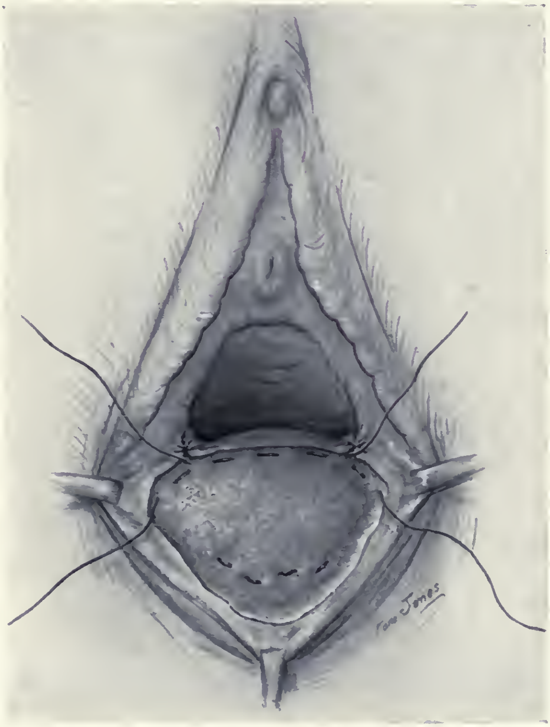

Fig. 434.—The circular suture about the rectocele in place, but not tied; the sutures in the sulci on either side in place, tied, and cut; Emmet's "crown-stitch" suture in place and untied.

The rectocele should be thoroughly inverted as the suture is tied, otherwise a knuckle of bowel wall may become included in the suture.

In the case of very large rectocele, the inversion may leave too large a dead space. In such a case the size of the rectocele is lessened by using one or two small circular sutures, placed superficially over the rectocele before the first "purse-string" suture is inserted.

Objection might be made to the displacement of the base of the triangular ligament which results when the first purse-string suture is tied. From observation in a large number of cases I have been unable in a single instance to see objection to this. It has not made an abnormally rigid perineum; it has permitted coaptation of firm tissues, and it has helped to restore the perineal body to its normal place, namely, not far from the pubes. The "crown stitch" in exceptional cases should be modified, so that it also will be tied without much tension upon the knot. This is accomplished by including less tissue than may

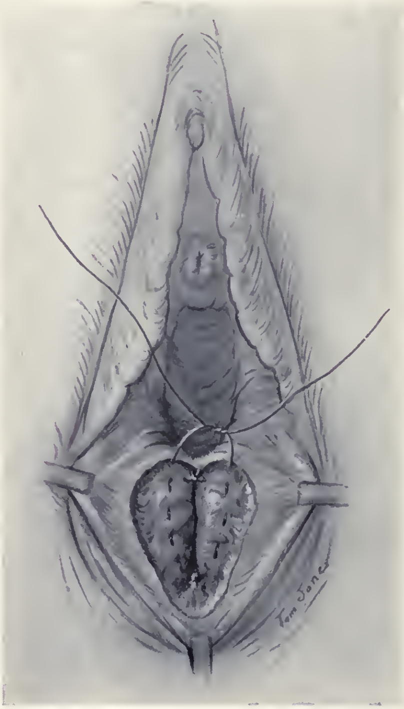

Fig. 435.—The purse-string suture of the rectocele has been tied and cut and has disappeared from view. The "crown-stitch" suture has been tied and cut, and its knot appears in the upper surface of the wound.

be required, and in exceptional cases it is well to use two of them, one under the mucous membrane of the posterior vaginal wall and a second to approximate the lateral surfaces.

The number of purse-string sutures employed should be adapted to the requirements in the individual case.

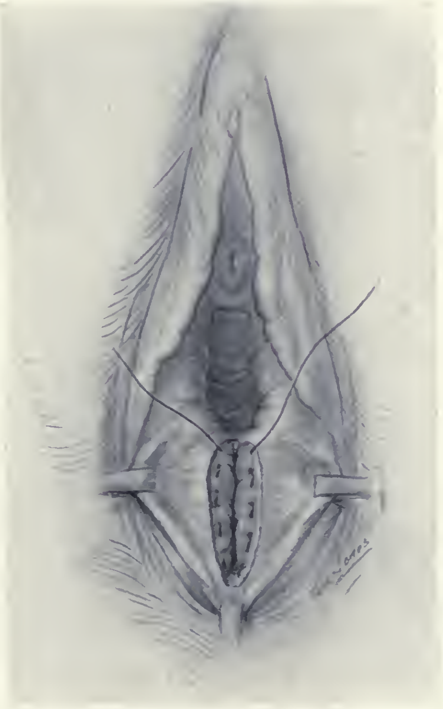

Fig. 436.—The submucous and subcutaneous suture completes the closure of the wound.

The depth of the sutures in a perineorrhaphy is not as important as the literature would suggest, as the depth of the suture does not necessarily determine the strength of the union. The union is limited to surfaces which are approximated.

The apposition of the fascial surfaces is much preferable to that of apposing muscle surfaces, as the union in either case is one of connective tissue. Suture of the muscle always means "cutting and atrophy." The suture shown in Fig. 436 can be placed as a circular suture or as the ordinary submucous suture.

The advantages of burying the sutures entirely are diminished dangers of infection and less pain. The operation when complete should show an anus and perineum restored to about normal location, and palpation to either side of the vaginal canal should show a large amount of tissue in the region of the pubic portion of the levator ani muscle.

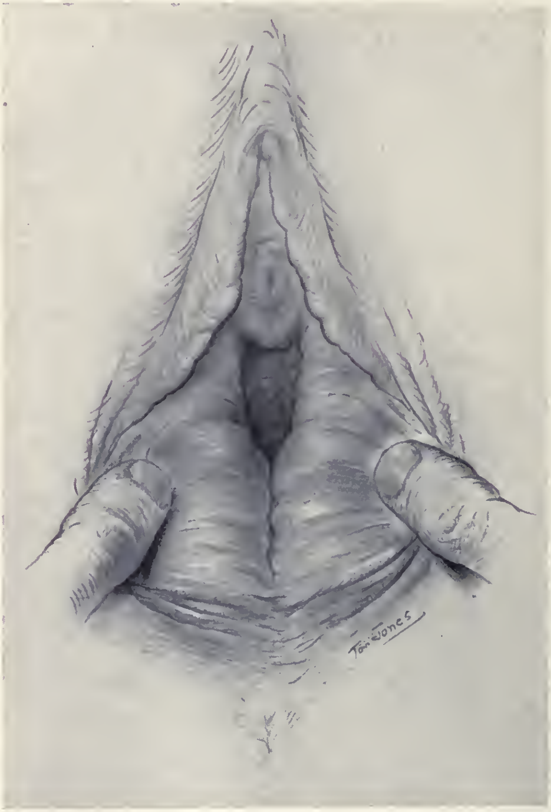

Fig. 437.—The operation is completed and all the sutures are buried.

CLINIC OF DR. GEORGE E. SHAMBAUGH

Presbyterian Hospital

DISCUSSION OF CLINICAL PROBLEMS RELATING TO THE FAUCIAL TONSILS

Summary: The faucial tonsils and focal infection; the recognition of infected tonsils—types of tonsillitis—chronic infections; indications for removal of tonsils in children—in adults; technic of tonsillectomy—the anesthetic—position of patient—operative methods—control of hemorrhage; complications of tonsillectomy—hemorrhage, subsequent attacks of sore throat; injury to pillars, soft palate and uvula; lung abscess—possible causes; brain abscess and general systemic infection; local trouble in pharynx following tonsillectomy—dryness of the throat—neuralgic pain—changes in the voice.

Faucial tonsils occupy today a much more important position clinically than ever before. In recent years a great many new problems relating to these structures have presented themselves. Foremost among these is the relation of tonsil disease to systemic infection. It has become recognized that a great many serious systemic disorders, such, for example, as rheumatism, nephritis, and cardiovascular diseases, owe their origin very often to disease of the tonsils. With this fact established, the question of the recognition of tonsil infection becomes at once a most important clinical problem, especially the recognition of chronic infection of the tonsil, which in itself causes no local symptoms of which the patient is aware.

Then there is the problem in connection with the indication for tonsil operation. This is by no means the simple question which the advocates of indiscriminate removal of the tonsils would have us believe. The operation itself, its technic and difficulties, as well as the subsequent complications, are all questions of acute interest to the general medical profession. Our views in regard to these problems have undergone very distinct changes in recent years. It is the object of this article to discuss these problems and the conclusions to which our experience has brought us.

The Faucial Tonsils and Focal Infection.—The importance which focal infection plays in the causation of systemic disease is becoming more and more apparent. The number of systemic disorders which owe their origin to foci of infection is constantly being added to. A complete list, which would include those diseases where the relation to focal infection has been definitely established, as well as those where foci of infection are suspected as an important etiologic factor, include a large number of disorders. Acute and chronic rheumatism, involving the joints as well as the muscles; neuritis, not alone of the peripheral nerves but also of the nerves of special sense, as for example, the optic and the acoustic nerves; acute and chronic nephritis, the cardiovascular diseases, are all included among those where the relation to focal infection is now definitely established. Goiter, appendicitis, gall-bladder infection, and skin eruptions, such as herpes zoster and acne, bronchial asthma, and the anemias, are all included among those conditions where foci of infection are often suspected as being the most important etiologic factor. The part which the faucial tonsils play as the focus for systemic infection is a very important one. On the other hand, the recognition of a condition which is known to be caused, as a rule, by focal infection does not in itself incriminate the tonsils. Other foci, such as infection about the teeth, the nasal accessory sinuses, and of the genito-urinary tract, often act the same way as does infection of the faucial tonsils. The tonsils apparently play a much more important part in causing systemic infection than do these other foci, excepting perhaps the teeth. It is quite easy to see why this is so. In the first place, the tonsils are so frequently the seat of acute streptococcus infection that we are prepared to see systemic infection as a frequent occurrence from this source. The structure of the tonsils is, moreover, admirably suited to retain infection once they become involved. Deep crypts extend from the surface through the substance of the tonsil to its capsule. Very often the tonsil is so hidden in the soft palate, or covered over by a fold of mucous membrane from the anterior pillar, as to close the openings of the crypts and facilitate the retention of secretion and infection in these pockets.

The Recognition of Infected Tonsils.—Recognizing the important part which tonsil infection takes in causing systemic disease, the detection of infected tonsils becomes a very important question. We do not accept the proposition that because the tonsils so often cause systemic infection, therefore all tonsils should be considered a menace and should be removed. This would lead to a great deal of unnecessary operating.

Tonsils which are the seat of attacks of acute tonsillitis are much less frequently overlooked than are the cases of chronic tonsillitis. The acute process produces, as a rule, such characteristic symptoms that it is readily recognized even in young children. Nevertheless, acute infection of the tonsils occurs in adults as well as in children which passes unrecognized as such by the patient or the parent. In children it is not uncommon for the associated gastro-intestinal symptoms to so overshadow any evidence of throat trouble as to obscure the fact that the patient is suffering from acute tonsillitis. Even when the child is old enough to complain of sore throat, there is often no mention of this condition, and it is only by examining the fauces that the tonsil infection will be detected.

A similar condition is not infrequently observed in adults. The patient will deny ever having attacks of acute tonsillitis, but will often admit having frequent attacks of acute sore throat. An examination during one of these attacks will disclose distinct evidence of tonsillitis. As a rule, patients recognize acute tonsillitis as such only when the tonsils are much swollen, or the seat of white patches—acute follicular tonsillitis. As a matter of fact, the milder forms of acute tonsil infection are quite common, and it is our experience that such cases are about as prone to have systemic complications as are the cases of more violent reaction. Where a patient denies having attacks of acute tonsillitis, but admits suffering from recurring acute sore throat, it is well to ask the patient's return during one of these attacks, when a careful examination of the fauces will disclose distinct evidence of tonsillar infection. On the other hand, it should be remembered that sore throat is by no means synonymous with tonsil infection. A circumscribed or diffuse pharyngitis occurs not infrequently when the tonsils do not appear to be involved.

The recognition of chronic infection of the faucial tonsils is often a much more difficult matter. Where the tonsils are much enlarged, as is sometimes the case, the presence of chronic tonsillitis can be readily detected. It should be borne in mind, however, that the presence of enlarged tonsils is by no means synonymous with infected tonsils. In children especially one frequently sees tonsils that are distinctly enlarged projecting into the pharynx, where there has never been an attack of acute tonsillitis, and where no local evidence of tonsil inflammation can be discovered. Such tonsils we do not class as cases of chronic infection, nor do we recommend their removal, especially when, as is often the case, they are found superficially located and not embedded between the folds of the soft palate. Of course when the enlargement is sufficient to cause obstruction in breathing, we advise their removal, just as we do adenoid enlargement which causes similar symptoms of obstruction. Enlarged tonsils in adults are more frequently infected tonsils, since the simple hypertrophy more frequently seen in childhood usually undergoes retrograde changes before adult life. We do, however, occasionally observe tonsils in adults that show a distinct enlargement, but where a careful examination fails to discover any positive evidence of chronic infection, and where there is no history suggesting attacks of acute tonsillitis.

In children chronic infection of the tonsils is usually associated with enlarged tonsils, and in most of the cases there is a distinct history of recurring acute inflammation. Examination between the acute attacks discloses tonsils that are not alone enlarged but are the seat of very marked congestion. When the tonsils are embedded in the soft palate they may be very much enlarged, and yet escape detection by a superficial examination. By causing the patient to gag and at the same time exploring the surface of the soft palate with a blunt tonsil hook (Fig. 438) is the best way of discovering the size of such tonsils. The retention of cheesy secretions in the pockets of the tonsils is by no means so common in children as in adults, and, as a rule, they are found only in tonsils that are enlarged, and especially in the cases where the tonsils are embedded in the soft palate. The presence of these cheesy masses may often be surmised by the detection of a bad odor on the breath.

Chronic infection in adults is frequently observed in tonsils that show no evidence of enlargement, but are decidedly shrunken. The evidence of infection in such cases is detected in several ways. In the first place, the surface of the tonsil as well as the adjacent anterior pillar may be the seat of a well-marked congestion, which is more significant when it appears in contrast with the normal mucous membrane in the rest of the pharynx. When the congestion over the tonsil is but a part of a general congestion extending over the remainder of the pharynx, we do not accept this appearance as an indication of infection in the tonsil. The latter condition is not infrequently caused by excessive smoking or overindulgence in alcohol.

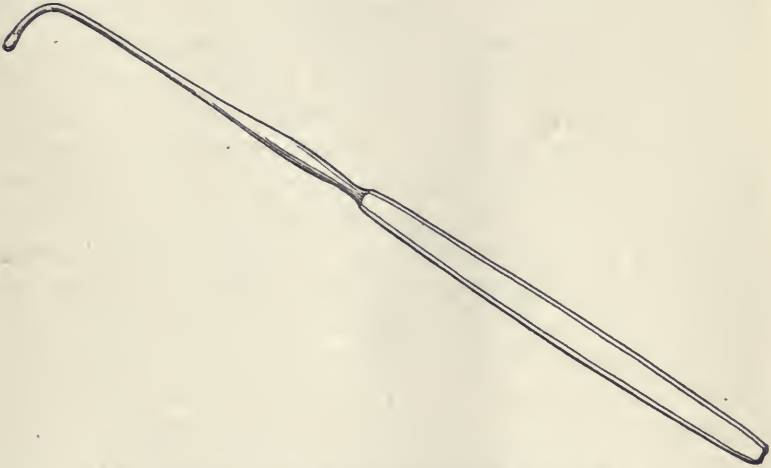

Fig. 438.—Blunt tonsil hook for exploration of the tonsillar region.

One of the most striking evidences of chronic infection is disclosed by the expression of pus from the tonsil. This is done by using a blunt tonsil hook and exerting pressure along the periphery of the tonsil over the soft palate. A tonsil from which pus can be expressed in this way, as a rule, shows other evidence of infection, especially the congestion described above. Expression of pus from the tonsil is not such a frequent phenomenon as some would have us believe. Pressure over the base of the tonsil very often expresses a semiliquid caseous deposit from the follicles which has a whitish appearance and is often mistaken for pus. Actual pus-pockets may be found in any part of the tonsil. More frequently this is discovered at the upper pole, but the same condition is also found at the extreme lower pole or around the middle of the exposed surface of the tonsil. In this connection it should be mentioned that larger or smaller pockets of pus are occasionally uncovered during an operation on the tonsil, the presence of which had not been suspected by the most careful examination before the operation. Still another condition of chronic tonsillitis is not infrequently discovered in examining the tonsils. Shining through the surface, in patches varying in size from a pinhead to a centimeter across, will be seen a yellowish fluid which cannot be expressed by pressure over the tonsil. There may be one or several such pockets in the tonsil. They represent follicles, the mouths of which have become closed. When slit open the contents are found to be a thick grumous pus. It is our experience that this condition is much less a menace than the one just described, where pus is expressed by pressure over the tonsil. The pus in the sealed pocket is often free from virulent organisms.

Another evidence of chronic infection of the tonsils is the presence of cheesy concretions in the follicles. As mentioned above, this condition may be found in children, especially where the tonsils are enlarged and embedded in the soft palate. The condition is much more common in adults, and is found in the small shrunken tonsil as well as in the tonsil that is enlarged. It is not infrequently associated with other evidences of infection, such as a distinct congestion over and about the tonsil. It is our experience that a majority of adults have this condition to a greater or less extent. Where the presence of these concretions is not especially marked, and particularly where it is not associated with other evidence of infection, such as enlargement and congestion, we are not inclined to consider their presence a serious menace. When the cheesy masses are large they usually produce an offensive odor of the breath, which in itself will at times justify the removal of the tonsils.

Aside from the annoyance caused by these cheesy concretions, chronic tonsillitis itself does not produce local symptoms by which the patient could detect the condition. Not infrequently, however, the chronic trouble is associated with attacks of acute inflammation which produces a sore throat of which the patient is quite aware. Tonsils that are the seat of recurring attacks of acute inflammation we would class as chronically infected tonsils, even though between the acute attacks the evidence of chronic infection may not be at all distinct. It is not uncommon to discover evidence of chronic infection when there has never been an attack of acute tonsillitis or sore throat that the patient can recall. Since tonsils, which are so frequently the seat of acute inflammation as to justify the conclusion that they are the seat of a focus of chronic infection, frequently disclose between attacks no positive evidence of such infection, and since chronic infection is often discovered where there has been no history of acute sore throat, the question naturally arises whether tonsils may not be the seat of a chronic infection even where there has been no history of acute tonsillitis, and where an examination fails to discover any evidence of a chronic infection. We have found that just such a combination may occur. We have removed tonsils because of a serious systemic infection where there had been no history of sore throat, and where the examination disclosed no superficial evidence of tonsil infection, and have opened into an abscess in the course of operation. This has occurred several times in our experience. It is our opinion that this combination is not at all common. As a rule, where tonsils play a part in causing systemic infection, there will be a history of attacks of acute tonsillitis, or an examination will disclose unmistakable evidence of chronic infection. In the majority of cases both of these conditions will be present. The only cases where, in the absence of recurring acute tonsillitis or local evidence of chronic infection, the removal of the tonsils is justified are those cases where the patient is suffering from a serious systemic infection, and where a thoroughgoing examination by an experienced internist fails to discover any other likely focus.

Indications for Removal of the Tonsils.—It is not many years since the operation for removal of the faucial tonsils was limited practically to children. Adult life was usually considered a contraindication to tonsillectomy. In children the indication for operation was chiefly an enlargement, especially where the tonsils projected free in the pharynx, and were not embedded in the soft palate. Since we have recognized that tonsil disease, acute as well as chronic, is frequently the cause of serious systemic infection, the indications for their removal have been very much widened. In children we still advise removal of enlarged tonsils, especially where the enlargement is sufficient to interfere more or less with proper respiration. Such a condition is, as a rule, associated with an enlargement of the pharyngeal tonsil (adenoids). The majority of the cases where today we recommend the removal of tonsils in children are cases where the size of the tonsil is not the determining factor. A child which is subject to recurring attacks of tonsillitis is, we believe, better off with tonsils removed. A child which has suffered from a serious systemic infection, such, for example, as an endocarditis or acute Bright's, as the result of an acute tonsillitis attack, should, we believe, have the tonsils removed, even though they are not enlarged and though there has been only this one attack of tonsillitis. On the other hand, a single attack of acute tonsillitis, where there has been no systemic complication and where the tonsils have not been left enlarged with evidence of a chronic infection, does not, in our opinion, constitute an adequate indication for tonsillectomy. Enlargement of the cervical lymphatics in children, as a rule, is the result of a persistent tonsil infection, and where this adenitis is at all marked it is unusual when there is not associated with this condition evidence of chronic infection or a history of attacks of acute tonsillitis. In all such cases the tonsils should be removed. The whole question of the indications for removal of the tonsils in children may be summed up briefly as follows: All cases where the tonsils are large enough to interfere with normal nasal respiration, cases where there is a history of recurring attacks of acute tonsillitis, cases where a serious systemic infection has complicated an attack of acute tonsillitis, cases where the tonsils are chronically infected, as shown especially by their enlargement, the presence of cheesy concretions and congestion about the tonsils, and, finally, where there is a well-marked cervical adenitis.

In adults the indications for tonsillectomy are somewhat different. The chief indication is the presence of a systemic infection, yet the removal of tonsils in adults is by no means restricted to such cases. An adult who is suffering from recurring attacks of tonsillitis should have the tonsils removed just as we advised for children. The danger from the operation and the resulting discomfort do not compare with that caused by an attack of acute tonsillitis. When the acute tonsil infection has been complicated by a peritonsillar abscess the need for having the tonsils removed is all the more urgent, especially as this is such a painful affection, and because the danger of serious complications is greater than in simple acute tonsil infection. A single attack of acute tonsillitis, if followed by a systemic infection, such as rheumatism, endocarditis, or Bright's disease, is an adequate indication for tonsillectomy, undertaken as a prophylactic measure against subsequent attacks which are prone to cause a recurrence of the systemic trouble.

When an examination of the tonsils discloses marked evidence of chronic infection we advise their removal, even though the patient may have had no local discomfort from attacks of acute infection, and though there is as yet no distinct indication of a systemic infection. The evidence of chronic infection which justifies the removal of the tonsils under such circumstances is as follows:

(1) When on making an examination one is able to express

pus from the tonsils. As pointed out above, the presence of pus in the tonsil should not be confused with the expression of a few drops of milky fluid which represent semiliquefied cheesy concretions from the tonsil crypts. The latter is much more frequently encountered than is the presence of pus, and has often been confused with an actual pus infection.

(2) When the tonsils are found enlarged and the seat of persistent congestion that is not simply a part of a diffuse congestion involving the mucous membranes of the pharynx.

(3) When the accumulation of the concretions in the tonsil crypts is very marked, and especially when these concretions are causing an offensive odor to the breath.

The most common condition requiring the removal of tonsils in adults is the presence of a systemic infection which owes its origin to some primary focus. In such cases the possibility of other foci than the tonsils must be kept in mind. This fact, together with the correct diagnosis of the systemic trouble, makes it extremely desirable that the throat specialist should not assume control of such cases. These cases should be handled in co-operation with a competent internist who is better able to determine when the disorder is due to a focal infection, and whether the evidence supplied by the specialist warrants the conclusion that the tonsils are the probable etiologic factor and whether they should be removed. It is our belief that the decision to operate in such cases should rest rather with the internist, who is better able to see all sides of the question. By handling the cases in this way we believe that the unnecessary operations on the tonsils can be reduced to the minimum.

The evidences of tonsil infection which justify their removal in cases where the patient is suffering from a systemic infection of focal origin we would summarize as follows:

(1) When there is a history of recurring attacks of acute tonsillitis, even though there may be no recent attacks, and where the systemic trouble has developed apparently independent of an attack of acute tonsillitis. Recurring attacks of acute tonsil infection mean, as a rule, that the tonsils are the carriers of a persistent focus of infection which we believe may cause sys-

temic infection even in the absence of an acute reaction in the tonsils.

(2) Cases where the systemic trouble develops as a complication of acute tonsillitis.

(3) Cases where there is a history of one or more attacks of peritonsillar infection. Such tonsils are especially prone to be the carriers of a persistent focus of infection.

(4) When an examination discloses evidences of a chronic tonsil infection, expression of pus from the tonsils, enlargement and congestion over and about the tonsils, or cheesy concretions in the tonsil crypts.

(5) Cases where there has been no history of attacks of acute tonsillitis, and where examination fails to disclose any distinct evidence of chronic infection, are operated only when the patient is suffering from a serious systemic disorder and when no other likely focus is discovered.

When we have followed these indications, we believe all the cases which will be improved by tonsillectomy will be cared for, and that we will be reducing to a minimum those cases where the removal of the tonsil will be followed by no distinct benefit.

It hardly seems necessary in this connection to emphasize the fact that the physician should always be guarded in the prognosis in these cases of systemic infection. We cannot safely promise any of these cases that the removal of the tonsils will cure their trouble. What we should make clear to the patients is that the trouble from which they are suffering is frequently the result of tonsil infection, and that they have the type of tonsil which we know does frequently cause this trouble, and, furthermore, that it often clears up after the removal of the tonsils. We should make it clear that we have no definite way of knowing whether in their case the tonsils are responsible for the trouble, or whether, even if the disorder has been originally due to disease of the tonsil, their removal is going to cure them. The patient should always understand fully the situation before we undertake the operation.

TONSIL OPERATION

The complete removal of the tonsils by enucleation has been practised only in very recent years. Formerly the amputation of the tonsil by means of a tonsillotome was carried out when an operation on the tonsil seemed advisable. The chief reason why the enucleation was resorted to was that so frequently after the operation of tonsillotomy infection persisted in the smaller or larger stub that remained after this operation, and because not infrequently the patient was found to have even more trouble from this source than before the operation.

In children the operation is always done under general anesthesia. It is not at all immaterial what anesthetic is employed. Serious results from the operation have been due more often to the anesthetic than to any other factor. The anesthesia may often be begun to advantage with nitrous oxid and oxygen, especially with nervous children. It is rarely necessary to have a struggle with the child if the anesthetic is administered tactfully by an expert accustomed to handling children. Gas anesthesia has sometimes been employed throughout the operation, but it is not so suitable for the careful successful removal of the tonsil as is ether.

Too often stubs of tonsils escape detection because of the haste with which the operation has to be performed, which will require a subsequent operation. The danger from inhalation of blood and infected material from the tonsil is greater with the gas anesthesia, especially since the upright position is often employed while under the anesthesia. When the operation is called for in children under two years, as is rarely the case, it is best to dispense with the preliminary gas, as this is a more dangerous anesthetic in young children than straight ether.

We attach a great deal of importance to the position of the patient during operation. We place the patient lying on the side with the left arm drawn under, the knees flexed so as to make the position of the patient more stable on the operating-table. The operator sits on a low chair beside the table, while the tongue depressor is held by an assistant. This position is much better than the more usual one with the patient lying on the back, as it prevents the inhalation of blood and obviates the necessity of using a suction apparatus to keep the pharynx free from blood. Such devices only add one more obstacle in the field of operation. To administer a general anesthesia with the patient sitting upright is, in our opinion, against the best teachings for administering anesthesia. The only advantage that can be claimed for the upright position is that it assists the operator who is accustomed to operating in this position. As a matter of fact, it is just as easy for the operator to work on the tonsils with the patient lying on the side.

The operation is not begun until the pharyngeal reflexes have been pretty well abolished. The method of choice in operating is not the same in all cases. When the tonsils are enlarged, and especially where they project rather freely into the pharynx, the method suggested by Sluder of pressing the tonsil through the ring of the tonsillotome or snare is to be preferred. We do not find, however, that this is the method of choice in all cases. Where the tonsils are small, and especially where the anterior pillar is short and rigid, the operation can be done with less traumatism by seizing the tonsil with a suitable tenaculum, lifting it out of its bed, and with a straight scalpel incising the attachment around the upper pole, freeing the anterior and posterior pillars. The lower tonsil is always loosened first, so that the bleeding will not interfere with the operation. When both have been prepared in this way for the snare, the lower tonsil is then drawn through the loop of the snare and the tonsil slowly cut off. The assistant then presses a gauze sponge firmly into the empty fossa and the anesthetist reapplies the ether cone for a few moments, while the operator is preparing the snare for the remaining tonsil. This tonsil is then removed in the same way and pressure applied with a gauze sponge to the tonsil fossa. The operation in children is never concluded without examining for adenoids and their removal when present. We prefer the La Force adenotome, followed by the Hartman curet, and then with the finger to make sure that Rosenmüller's fossæ have been carefully cleaned out. With a large gauze-sponge pressure is then made against the soft palate, forcing it up into the postnasal space. This tends to check the bleeding and to prevent the blood from this region from getting into the lower pharynx. Should it be discovered that there is still bleeding from any point in the tonsil fossæ, the bleeding point is seized with a curved artery forceps and held for a few minutes. We have not found any necessity for ligation of vessels where this method has been employed.

The operation in adults is quite a different affair. Until quite recently the operation for removal of tonsils was contraindicated in adult life. It is only since we have appreciated the full importance of the tonsil as a focus for systemic infection that we have learned that the tonsils can be safely removed in adults. Formerly when the tonsils were the seat of disturbing local symptoms, recurring attacks of acute infection, or gave annoyance because of cheesy concretions in the crypts various methods were resorted to for giving relief. Among these, the slitting of the tonsil crypts and the reduction of the tonsil by means of the electrocautery were the methods chiefly employed. These methods have now been replaced by the operation of tonsillectomy, for the reason that the older methods often failed to eliminate the foci of infection. Indeed, it was found that the partial removal of the tonsil by the operation of tonsillotomy or the use of the cautery often left a condition more troublesome than before. It appears that the scarring over of the surface of the tonsil without removing the foci of infection in the depths of the crypts provided a condition from which systemic infection was more likely to result than where the tonsils had not been disturbed. The operation of slitting the pockets for the relief of the annoyance from cheesy accumulations is still employed, but it is our opinion that when the tonsils are suspected of causing systemic infection their complete enucleation should be resorted to, except where this operation seems too dangerous because of high blood-pressure.

The technic of the operation for enucleation of the tonsils in adults is quite different from that employed with children. The safest and best way is to do the operation under local anesthesia. The patient rarely experiences any pain during the operation, the bleeding is more easily checked, and the danger of a complication from the operation is less than when a general anesthetic is used. All in all, the discomfort which the patient suffers during and after the operation is very much less when local anesthesia is employed. The anesthesia is obtained by rubbing a small pledget of cotton saturated in a 5 per cent. solution of cocain made up in adrenalin, 1 : 1000, around the attachment of the tonsil. The application should be continued until the surface of both tonsils is thoroughly deadened. This is then followed by the injection of novocain solution, 1 : 200, along the posterior pillar just beneath the mucous membrane.

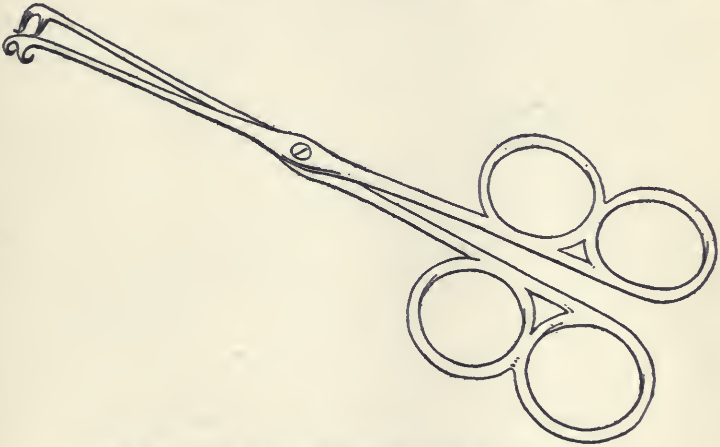

Fig. 439.—Forceps used in lifting tonsil out of its fossa.

A deep injection is then made into the lower pole of the tonsil. By pressure with a curved needle over the soft palate the location of the base of the tonsil is determined, and injections are made by forcing the needle through the anterior surface of the soft palate into the capsule at one or more points. Difficulty is not infrequently encountered in having these deep injections retained, as the fluid is prone to escape through the tonsil crypts when the point of the needle fails to enter the capsule. This is especially true when they have become adherent through peritonsillar infection. A complete anesthesia cannot be obtained when the deep injections have not been successfully carried out.

Both tonsils are first loosened before either is removed. This is done by seizing the tonsil by suitable forceps (Fig. 439) and lifting it out of its fossa. An incision is then made with a long-handled sharp scalpel (Fig. 440) along the line of attachment of the mucous membrane, over the upper pole, and along both anterior and posterior pillars. When this has been accomplished for both sides, one tonsil is pulled into a tonsil snare (Fig. 441), employing a stiff No. 8 piano wire. The cutting off of the tonsil by the snare may be carried out slowly, so as to aid in checking the bleeding. As soon as the tonsil is removed the fossa is hastily inspected for spurting arteries. When these are located, each point is seized by a curved artery forceps and held for a few moments. As a rule, there are but one or two such spurting arteries. The largest one is usually found about the junction of the middle with the lower third of the tonsil fossa. Another point is sometimes found near the upper pole and another at the lower pole. The forceps can be removed after a few moments, and the enucleation of the second tonsil accomplished in the same way. When the bleeding keeps up because of difficulty in finding the bleeding point, the bleeding can often be checked immediately by having the patient gargle with ice-cold water. The patient should not be taken to his room until we are quite sure that the bleeding has been com-

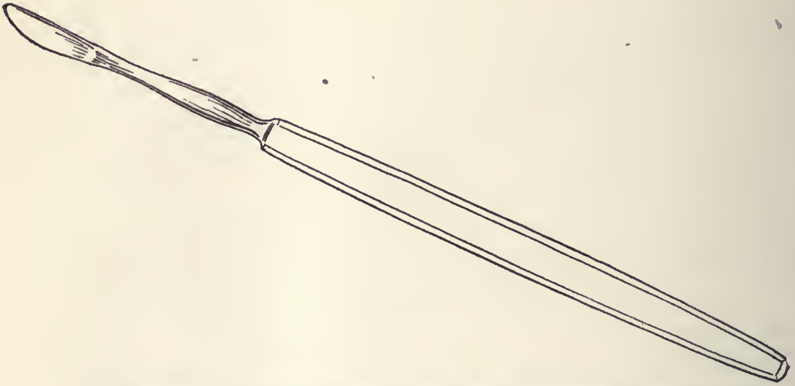

Fig. 440.—Long-handled sharp scalpel for dissection of tonsil.

pletely checked. We aim to keep the patient on the operating-floor for about ten minutes after the operation. When this precaution is employed it is extremely rare for us to be annoyed by subsequent bleeding. The cases which formerly gave us trouble were, as a rule, cases where a slight oozing was allowed to go unchecked at the time of operation. This we have found usually came from an artery which opened up and bled more freely after the patient recovered from the immediate shock of the operation. After both tonsils have been removed, one should examine carefully the region of the lower pole. An elongation of the tonsil in this region often exists which is not brought into the snare. This fragment if not removed may subsequently enlarge, giving the impression that the tonsil has recurred. In other cases this fragment remains a focus, causing systemic infection.

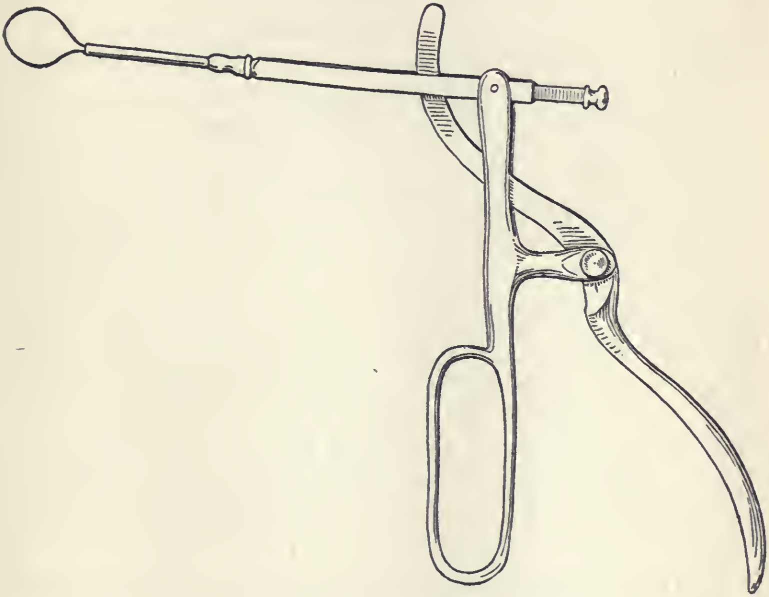

Fig. 441.—Type of tonsil snare best adapted for complete enucleation.

Complications.—Under this heading I wish to discuss, first, situations which may arise during operation causing unusual difficulties, and, second, conditions which occur as a result of the operation.

As regards the operation itself, this is by no means the simple procedure which some would have us believe. This is particularly true in those cases where the need for the operation is the greatest. In cases where the tonsils are not adherent, and where there are no general conditions to make the operation difficult, the procedure is often simple enough, especially when performed by one who has become dextrous in the technic. On the other hand, where the tonsils have become adherent as the result of recurring attacks of peritonsillar inflammation, and especially if they are at the same time enlarged tonsils, the operation in any one's hands may be a difficult one. It is our belief that the operation is as much of an undertaking for the patient as is the operation for removal of the appendix. Quite often, too, the operation is called for in patients very much weakened because of a serious systemic infection, such as an endocarditis, or in the case of goiter. Here the difficulty of the procedure is very much increased because of the general condition. In all the cases where in adults either local or general conditions complicate the operation the local anesthesia is preferable. In cases where the tonsils have become adherent because of peritonsillar inflammation the difficulty of the operation is due to two factors—first, the difficulty of securing a satisfactory anesthesia, and, second, the fact that the tonsil cannot be lifted from its bed and drawn into the snare for enucleation. As regards the anesthesia, in spite of every care, we have often found it impossible in these cases to secure anything approaching a complete anesthesia. In spite of this fact, however, we prefer to operate these cases under the local anesthesia. The same is true of the serious systemic conditions referred to above. The increased danger to the patient when the general anesthesia is employed makes us choose the local anesthesia.

It is important that the tonsils be carefully dissected from the pillars, particularly from the posterior pillar. When the latter is injured during the operation the result is usually more serious than when the anterior pillar is injured. The resulting contraction in either case pulls the soft palate over toward the injured side. When the injury has been to the posterior pillar, the lateral band of the pharynx on that side is prone to become infiltrated, subjecting the patient to the symptoms of chronic pharyngitis. Not infrequently the thickened lymphatic tissue in the region becomes the seat of attacks of acute inflammation, with the symptoms which are characteristic of acute tonsillitis.

It happens occasionally that the uvula is engaged in the snare when the tonsil is being removed. This accident is likely to be more or less serious, as the uvula is not only amputated close to its attachment, but the free edge of the soft palate on that side is almost sure to be denuded of mucous membrane. The resulting contraction is often surprisingly great, and it is in these cases particularly that the function of the soft palate is often sufficiently interfered with to produce a permanent defect in the speech.

It sometimes happens that after the tonsils have been enucleated the uvula becomes very much swollen and edematous, and when this was already relaxed and elongated before the operation the subsequent edema may be the source of great discomfort to the patient. We have had several cases of this sort where, on the second or third day after the operation, we have resorted to amputation of the swollen uvula, to the great relief of the patient. After several experiences of this sort, we found it desirable to amputate the uvula at the time of the tonsil operation in those cases where before the operation it was found very much elongated. It is advisable not to take off more than half or at most two-thirds of the uvula, for the subsequent contraction of the scars from the tonsil fossæ and the base of the uvula will result in making the free edge of the soft palate quite taut, forming a perfectly straight line (Fig. 442).

There is a type of tonsil not infrequently met with where an enlarged upper lobe lies embedded deeply in the folds of the soft palate. Should a tonsil of this type become adherent as the result of peritonsillar inflammation, so that it cannot be lifted from its bed, its removal becomes a difficult matter. In one case of this sort we saw after the operation a paralysis of the soft palate result which persisted for several weeks, causing great discomfort to the patient because of the regurgitation of liquids into the nose when attempting to swallow.

All in all, the operation for removal of faucial tonsils is not a simple procedure. It is not always possible to estimate before the operation the difficulties one may encounter in a particular case. These difficulties, and the fact that permanent serious results may follow injury to the surrounding structures, places the operation for enucleation of the tonsils among those that should always be in the hands of the specialist.

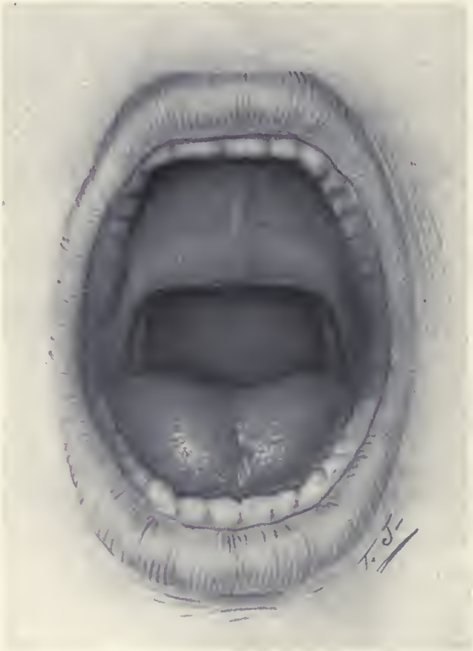

Fig. 442.—Type of deformity following amputation of excessive amount of uvula and tonsillectomy.

Not the least among the difficulties encountered in operating on the tonsils is the danger from serious bleeding. One hears constantly of cases bleeding to death after tonsil enucleation.

Here again we have no positive way of determining beforehand all the cases that may give trouble from bleeding. In those cases where the danger of hemorrhage results from failure of the blood to coagulate promptly, this can be ascertained before the operation and calcium salts administered. When the patient gives a history of a bleeding tendency, and when the diagnosis of hemophilia can be made, an operation on the tonsils should not be undertaken. A very high blood-pressure increases the danger of bleeding, and it is well to ascertain the condition of the blood-pressure in adults where we have reason to suspect an elevation. It happens not infrequently that infection of the tonsils is suspected as a cause of increasing the blood-pressure, and because of this removal of the tonsils seems all the more important. We have found the administration of morphin hypodermically, in doses of $\frac{1}{6}$ or $\frac{1}{4}$ grain just before the operation, a good means for lowering the blood-pressure and making the patient less nervous during the operation. Tonsil hemorrhage is sometimes serious, and the checking of a serious bleeding is not an easy matter. We have had a great deal of experience in checking tonsil bleeding, and have so far never had a fatal result. We have found that a most important measure in preventing serious bleeding is to seize the bleeding point with a curved artery forceps immediately on removal of the tonsil, and, if possible, while the blood is still spurting from the severed arteries. Subsequent bleeding is rare where this precaution is carried out. We have not found it desirable to prolong the operation by attempting to ligate the bleeding vessels, nor have we ever resorted to the practice of sewing up the pillars to control bleeding. We are not in a hurry to send the patient back to his own room, but prefer to have him kept on the operating floor ten or fifteen minutes after the operation has been completed. If at the end of that time there is no bleeding the patient can be sent to his own room. It is unusual for a hemorrhage to occur later, provided all bleeding points have been once completely checked. It is not always an easy matter to seize the bleeding vessel, especially when the hemorrhage is very free. Gargling with ice-water often assists in checking a profuse bleeding. Compression in the tonsil fossa with a sponge saturated with H_2O_2 may also be tried. When the patient is taken to his own room he is left sitting up, supported by a back-rest, with an ice-bag around his neck. Troublesome bleeding may take place any time during the first twelve hours after the operation. When it occurs, it is well to give the adult patient a hypodermic of morphin, $\frac{1}{4}$ grain, with $\frac{1}{150}$ grain of atropin. This is especially desirable where the patient is at all nervous. Very often this alone will suffice to check the bleeding. When other measures are called for it is important to bear in mind that a patient soon becomes intolerant of manipulations in the throat in efforts to check hemorrhage. For this reason it is well to make all preparations for effectively stopping the bleeding before beginning the effort. The first step is to cleanse the fossa of clots which will be found filling up the side from which the bleeding occurs. With reflected light, using a head-mirror, one can usually determine readily just where the bleeding point is located. The most satisfactory method is to seize the bleeding vessel with a curved artery forceps. This is allowed to remain attached long enough to make sure that no more bleeding is likely to occur. Half an hour will be sufficient. Ligation is not to be recommended, for the reason that the hemorrhage is adequately stopped by means of the artery forceps, and the manipulations necessary to place the ligature only serves to further exhaust the patient. It may happen that, owing in part to the nervous condition of the patient, one will find it difficult to discover the bleeding vessel. Under these conditions a sponge soaked in H_2O_2, and pressed firmly in the tonsil fossa for a few moments, will often stop the bleeding. A more effective measure is to prepare a sponge by moistening in water and then dipping in powdered ferropyrin. When this is pressed in the tonsil fossa it acts as a powerful hemostat. Continued pressure by means of a specially devised tonsil hemostat, such as the one perfected by Corwin, will sometimes have to be applied. We have had cases where one of these had to be applied in each tonsil fossa and left in position several hours. After the first twelve hours bleeding is not at all likely to occur.

Secondary hemorrhage after a tonsil operation is especially likely to occur between the sixth and eighth days after the operation. We have seen this take place as late as the tenth day.

Serious complications other than bleeding may follow tonsil operations. Among these the development of a lung abscess is perhaps the most common. Such abscesses, it seems, may occur as the result of a hematogenous infection, but it is probable that in most of the cases the abscess is the result of inhalation of blood and infected material during the operation. In view of the methods often followed in operating on the tonsils, it is indeed surprising that lung complications from inhalation are not even more common. The practice of operating under ether with the patient lying on the back, especially when the so-called Sluder technic is employed, is especially favorable for the inhalation of blood and débris from the tonsils. The operator in using this method is inclined to rely more and more on the sense of touch for engaging the tonsil, and frequently completes the operation in a lake of blood which fills the pharynx. We have found that the simplest and most efficient way of avoiding the inhalation of blood during a general anesthesia is to place the patient on his side. The operator sits on a low chair. In this position the blood trickles out of the mouth, and it is not at all necessary to obstruct the field of operation by a suction apparatus.

There is another faulty technic which has been responsible for not a few cases of lung abscesses from inhalation. This is the practice of operating under nitrous oxid with the patient sitting upright. This, in our opinion, is even more dangerous than operating under ether with the patient lying on the back.

Aside from the occurrence of lung abscess, serious systemic complications occasionally follow the tonsil operation. Considering the frequency with which systemic infection develops as a sequel of infection in the tonsil, it is not surprising that the operation for the removal of infected tonsils will give rise occasionally to systemic complications. It has been a surprise to us that such complications are as infrequent as they appear to be. When removing infected tonsils from patients suffering from chronic rheumatism with recurring acute exacerbations, it is not so infrequent to observe a more or less acute attack of the rheumatism immediately after the operation. We have come to look upon this phenomenon, on the whole, as a favorable sign, as it is a rather clear demonstration that the systemic trouble for which the tonsils were removed was being caused by the tonsil infection. The acute exacerbation that follows the tonsil removal is in many cases the last of such attacks, and the patient gradually makes a complete recovery from his chronic systemic trouble.

In the same way we have observed the development of acute endocarditis in a patient where there had apparently been no previous trouble of this sort, as a direct complication of the removal of infected tonsils. It is the occurrence of such cases of systemic infection that has led us to the belief that even the complication of lung abscess may occur occasionally as the result of a systemic infection, rather than through the inhalation of blood and infected material from the tonsil, which is, we believe, more frequently the cause.

Brain abscess, as well as pyemia with the development of meningitis, has been observed as the sequel of the operation for removal of infected tonsils. We have seen a case recently where an adult suffering from various conditions suggesting systemic infection, among which was the presence of a goiter, was found to have badly infected tonsils, which were removed under a local anesthesia. On the third day after the operation the patient developed a septic temperature, passed quickly into a state of general pyemia with meningitis, and died in a few days. We wish to repeat that, while these serious systemic infections occasionally follow removal of infected tonsils, the frequency of such complications is much less than we might expect. Considering the large number of cases which are being operated at present for infected tonsils, the percentage of cases in which serious systemic infection occurs is extremely low. It is certainly no greater than follows any other operation of similar character. The fact that such complications do occur hardly constitutes an argument against removal of tonsils when the indications for the operation clearly exist. On the other hand, the possibility of such complications should impress on the mind of the physician that the tonsil operation is not a minor surgical procedure, which can be undertaken as a general prophylactic measure even where no well-defined indications are present. The indiscriminate removal of the tonsils, as advocated in some quarters, is, in our opinion, to be deprecated.

The development of local trouble in the pharynx after the tonsils have been removed remains still to be considered. This is not an infrequent condition, and its possibility should always be kept in mind when one is advising removal of the tonsils. Local trouble arises in several ways. We have already referred to the contractions of the soft palate which result from injury to the fauces, and when the uvula has been clipped too close to its base, but especially when this structure has unintentionally been caught in the snare when removing the tonsil. We have had occasion also to refer to the infiltration of the lateral bands of the pharynx which develops so frequently when the posterior pillar has been injured. Recurrence of the lymphatic tissue in the tonsil fossa occurs not infrequently from a hypertrophy of the nodule of lymphatic tissue, located in the angle between the lower pole of the faucial tonsil and the lingual tonsil. At its lower pole the faucial tonsil shades off imperceptibly, and frequently there is a more or less gradual transition from the tissue constituting the faucial tonsil into that of the lingual tonsil, so that it is not at all easy to say from inspection of the pharynx just where the one terminates and the other begins. Nodules of lymphoid tissue at the lower pole of the faucial tonsils are not infrequently left after the tonsil operation. Such nodules may cause trouble not alone by undergoing subsequent hypertrophy, which constitutes the so-called recurrence of the tonsil, but more frequently by their retaining a focus of infection which tends to keep up the systemic trouble for the relief of which the tonsil operation was undertaken. Such foci may be shown by the presence of tonsil crypts in which cheesy concretions accumulate, and which are not infrequently the seat of recurring acute infection. At other times chronic infection can be discovered in these lymphatic nodules from which pus can be expressed.

Much more troublesome are the nodules of tonsil tissue which sometimes remain at the upper pole after the tonsil operation. Such nodules very often cause trouble, either as the seat of attacks of acute tonsillitis or as the focus of distinct tonsil abscesses. Occasionally, after what appears to be a complete enucleation of the tonsil, one discovers a fistulous passage leading into the scar, usually about the upper or middle thirds of the fossa. Such fistulæ are, as a rule, the seat of a chronic infection from which cheesy masses or even pus can be expressed. In other cases the fistulous tract becomes the seat of recurring acute infection. The slitting open of such fistulæ will not suffice to cure the difficulty. The scar in this locality must be dissected away, when a smaller or larger nodule of tonsil tissue will be uncovered. This must be removed before the tonsil trouble will disappear. The occurrence of nodules of this sort is much less frequent when the operation has been performed by an expert in this sort of work, but our experience from examining patients operated elsewhere has shown us that this may happen in the hands of any operator.

Annoying local symptoms in the region of the tonsil fossa, persisting after the throat has healed, are also observed in some cases. Sometimes this is in the nature of an annoying dryness. At other times the patient experiences a sensation of constriction and even of severe neuralgic pain. This pain sometimes radiates up to the ear. It is present after a great many tonsil operations, especially in adults, but disappears usually after a few weeks. We have seen cases where it has lasted six months. As far as the annoyance from the scar formations in the fossæ is concerned, this gets better as time goes on, and the scar formations undergo some absorption. The annoyance from the sensation of dryness is likely to be much more persistent. Many of the symptoms in the pharynx which persist for a long period after a tonsil operation are not unlike the paresthesias associated occasionally with any form of chronic pharyngitis.

The effect of the tonsil operation upon the voice should always be kept in mind. There is a general impression that the singing voice may be permanently injured as the result of enucleation of the faucial tonsil. The same impression existed as regards the amputation of the tonsil formerly practised. In view of the symptoms in the pharynx which occasionally persist after the tonsil operation, it is not surprising that harmful effects to the singing voice may sometimes be noticed. I do not think we are ever able to promise a patient positively that such a result may not take place. As a rule, however, where a tonsil operation is undertaken in a singer, the indications would warrant the operation, even though there may be some chance of an unfavorable action on the singing voice. The condition for which the operation is undertaken, for example, frequent attacks of acute tonsillitis, is much more of a menace to the voice than is the removal of the tonsils. Whenever the removal of the tonsils is contemplated in a singer, the situation should be gone over very carefully with the patient, and in case the decision is reached to operate the greatest care should be exercised in doing the operation, guarding especially against injury of the pillars. In our opinion, the operation under local anesthesia is much less likely to result in such injury than where ether is employed.

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

COMPOUND COMMINUTED FRACTURE OF BOTH BONES OF THE LEG

Summary: History; immobilization of no value in this case; operation—condition of bones—fixation by means of chromicized catgut—closure; dressing.

History.—The patient, a married woman of forty-two years, was admitted to Augustana Hospital August 19, 1918, with a compound comminuted fracture of both bones of the leg at about their middle.

Her family history is negative. February 19, 1917, she was admitted to this hospital suffering from a comminuted fracture of the lower end of the right tibia and fibula, with a dislocation of the ankle. Under an anesthetic the fracture was reduced and a plaster-of-Paris cast applied. The cast was removed on July 3, 1917, and she had no trouble with the leg until she sustained the present injury.

Comments and Operation.—DR. OCHSNER: From the amount of traumatism present it is plain that a satisfactory result cannot be expected from the simple use of immobilization. The soft tissues have been perforated at two points by fragments of the fractured bone. There is undoubtedly a considerable amount of muscle and fascia between the ends of the fragments, which are badly displaced. The question remains as to whether it will be best to make use of a temporary immobilization until the external wound has been healed, and then to perform a secondary operation, probably with the use of Lane plates, or whether it would be better to expose the fracture at once, adjust the fragments, and hold them in position artificially. The latter method seems preferable.

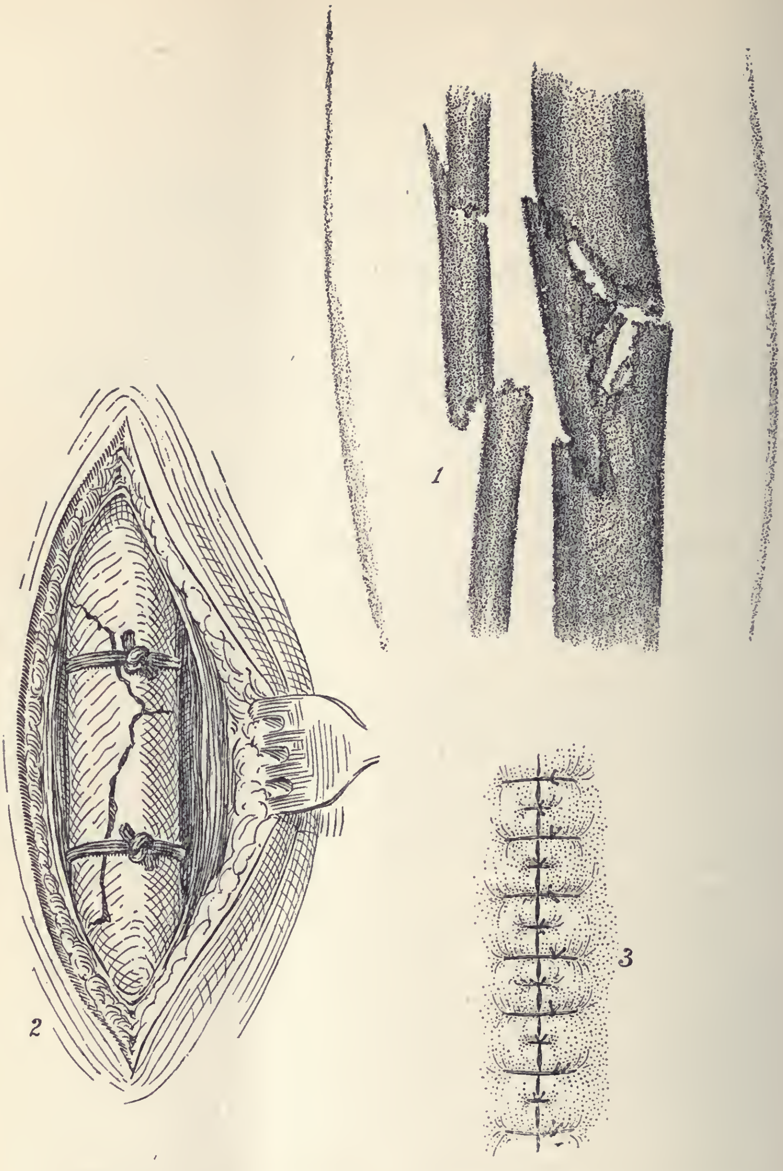

Fig. 443.—A comminuted fracture of the middle of both bones of the leg. 1. x-Ray appearance of fracture. 2. Through an anterior incision the fragments of the tibia were freed of all loose bits of torn muscle and blood-clots. The wedge-shaped piece of bone was fitted in place and fixed by means of two circular ligatures of chromicized catgut. Each ligature consists of four strands of the heavy gut. 3. The wound closed by alternate tension and coaptation sutures.

After thoroughly scrubbing the entire surface with benzine, and then painting it with tincture of iodin, we make an incision directly over the spine of the tibia, 30 cm. in length, in order to expose the fragments carefully. The fractured tibia shows the condition illustrated in Fig. 443, 1. Between the two main fragments there is a wedge-shaped piece which is adherent to its periosteum, and which it is possible to place in its original position by manipulating the two ends, so that it gives the appearance shown in Fig. 443, 2.

The question now arises as to the advisability of fastening this fragment in place by means of a Lane bone-plate, or holding it in position by means of wire ligatures, or by the use of chromicized catgut. The last method has been chosen. No. 2 chromicized catgut is threaded double through the eye of a curved needle, making a strand of four filaments. The needle is carried around the bone and the catgut carefully tied, as shown in Fig. 443, 2. The leg can now be moved without displacing these fragments. The periosteum is sutured in place, and the skin is sutured over the periosteum, as shown in Fig. 443, 3. The wound is sutured with silkworm-gut sutures throughout, which will be left in place for six weeks until the cast is removed. A dressing is placed over the entire surface and a cast is applied, including the foot and thigh, care being taken not to displace the fragments, and also to secure a perfect position of the tibia and fibula, the knee being very slightly bent. The foot is placed at a right angle in order to facilitate walking after the fracture is healed. If one permits a plaster-of-Paris cast to harden with the foot in an equinus position, it usually requires several weeks of practice after the bone has been united before the patient can walk with any comfort.

The advantage of using a bone-plate in a case of this kind is, of course, in the fact that it will hold the fragments absolutely in position, but in compound fractures we have always preferred to make use of fragments of bone rather than of foreign bodies.

PLASTIC ON FACE

Summary: History; the best time for the correction of deformities of the face following gunshot wounds; condition of face in present case; technic of repair of lip; correction of ectropion—Thiersch graft—closure; after-care.

History.—The patient, a man about forty, was admitted to Augustana Hospital because of a deformity of the face.

One year ago the patient was shot by tripping over a shotgun. Shortly after the accident he consulted Dr. Ochsner, in order to have a plastic operation performed, but was advised against it because of the inelasticity of the tissues and the great amount of scarring present. He was advised to return in six months.

The entire left side of the face is deformed by a hollowing out of the cheek and a portion of the ear. The resulting scar formation has produced a marked ectropion of the left eyelid. His chief complaint is an overhanging of the upper lip at the left corner, in such a way that there is a continual drooling, and it is for the correction of this that he comes to the hospital. There are eight duck shots still remaining subcutaneously over the mastoid region.

Comments and Operation.—DR. OCHSNER: In correcting deformities such as the one illustrated in Fig. 444, following gunshot wounds that have carried away a considerable portion of the face, there are two times when the surgeon can do most for the patient, namely, at the time the injury occurs, when what is left of the face can be placed in the most favorable condition for future use; and, second, after the scar has become thoroughly soft and pliable. There is a time between these two stages when surgical treatment is not likely to be very satisfactory in its results, because the tissues are not pliable, and because of the inelasticity, which must be taken into account in reconstructing these deformities.

The patient before us consulted Dr. Percy and myself some six months ago, when all the scars were severely congested, and we advised him to postpone operation until the present time. The contracting scar-tissue has pulled outward the angle of the mouth to a point halfway between its normal position and the position of the ear. From the same cause the lower eyelid has

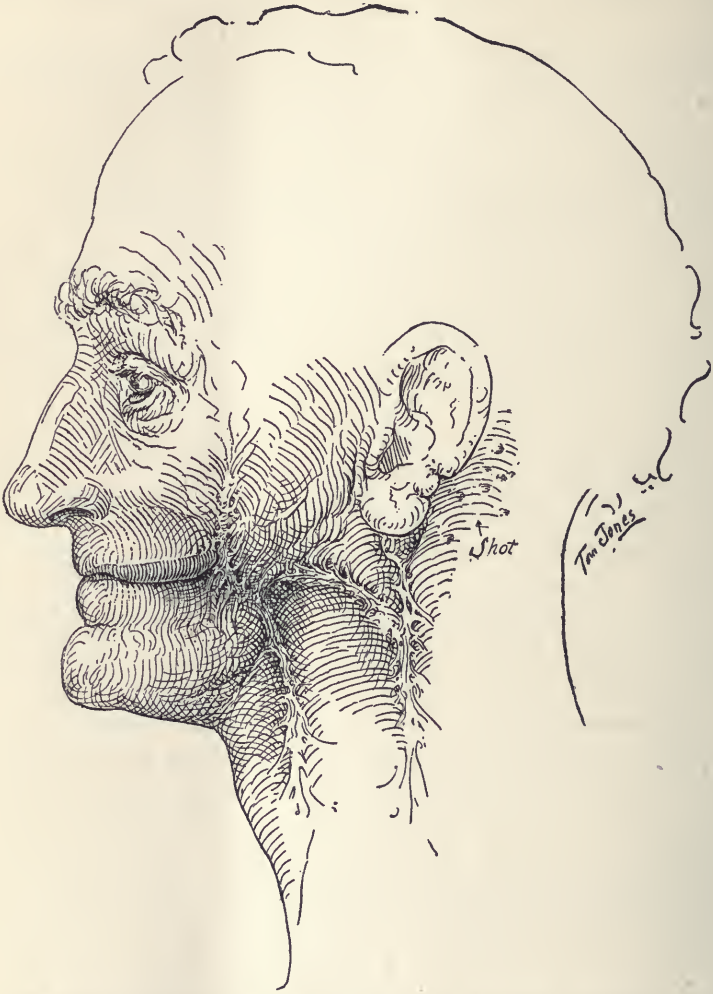

Fig. 444.—Deformity of face and cheek with spider-like contracture bands caused by a gunshot wound. Note the overhanging and laterally displaced upper lip, ectropion of the lower eyelid, and loss of substance of part of the left auricle. A number of buckshot are embedded in the skin over the mastoid region.

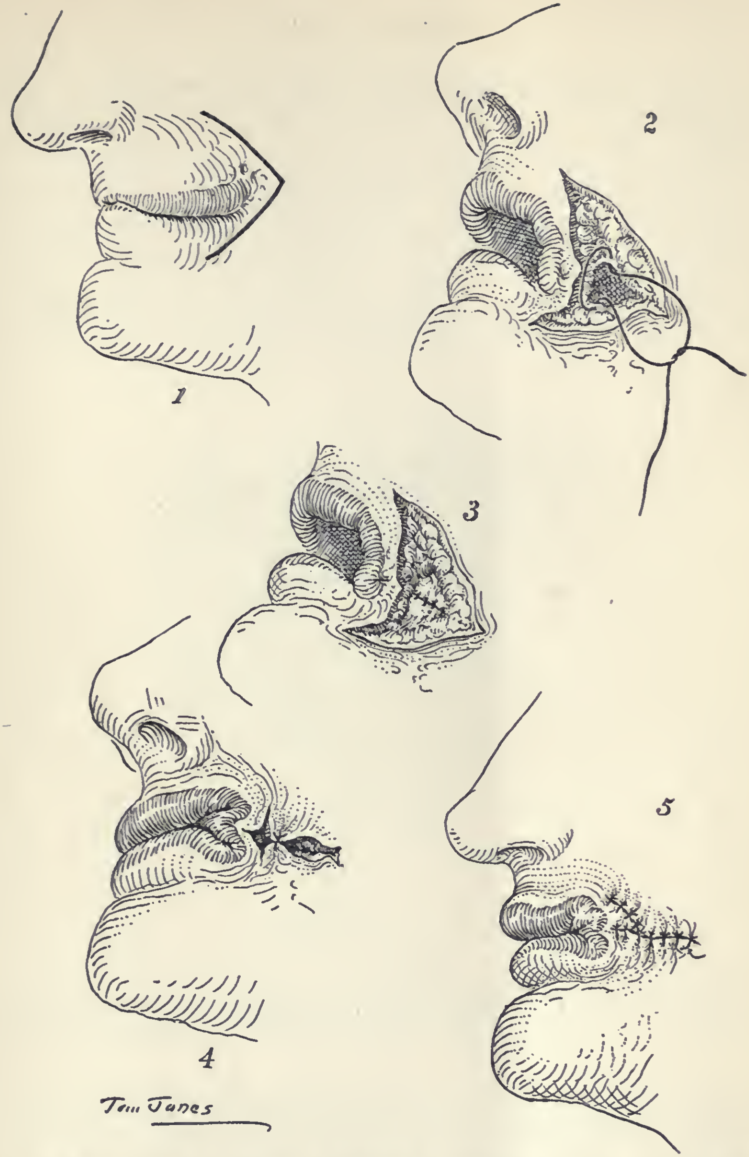

Fig. 445.—Plastic operation on the angle of the mouth with the object of bringing the upper lip in apposition with the lower and thus prevent drooling. 1. An angular incision about the corner of mouth. 2. The incision carried down through the buccal mucosa. Separate sutures being applied to mucous membrane in such a way that the knots come within the oral cavity. 3. The mucous membrane completely sutured. 4. The corner of the mouth pushed medially and held in position by stitches as shown. 5. The incision closed, showing also the appearance of the corner of the mouth. Note the great degree of overcorrection.

been drawn down so as to expose its mucous membrane and to prevent closure of the eye, giving rise to a marked ectropion of the lower lid.

It becomes necessary to make a wedge-shaped incision, as indicated in Fig. 445, 1, in order to make it possible to slide the angle of the mouth forward a distance of 3 cm. In all these conditions, in order to correct the deformity sufficiently, it is absolutely necessary to overcorrect. Otherwise, when a future contraction of scar-tissue occurs, the deformity will in a measure recur. As the scar-tissue extends through the entire thickness of the lip, it becomes necessary to carry the incision through its entire thickness, including the mucous membrane, as shown in Fig. 445, 2. The mucous membrane is sutured from within, so that the knots of the sutures are tied on the buccal side of the incision, leaving the line of closure free from suture knots, as shown in Fig. 445, 3. The angle of the mouth is then drawn

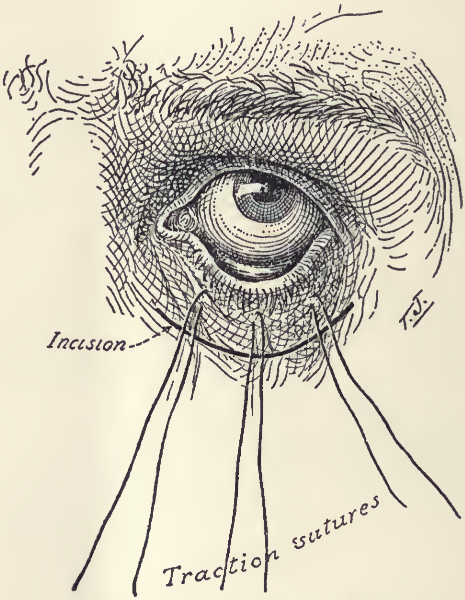

Fig. 446.—Ectropion of the lower eyelid in the same case. The line of incision with traction sutures in place.

forward and the wound is closed, as shown in Fig. 445, 4, 5, carrying the angle of the mouth slightly farther forward than normal. This resulting deformity will, however, correct itself very rapidly after the wound is healed.

By making use of one or more such triangular incisions one can overcome a large majority of the deformities of the face that one encounters.

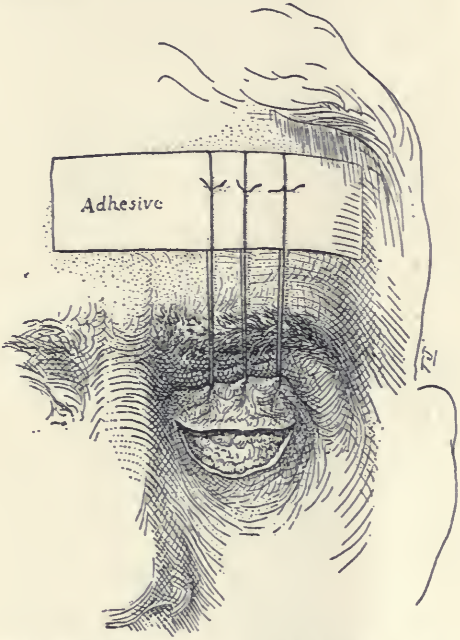

Fig. 447.—The lower eyelid has been freed by under dissection and the traction sutures attached to an adhesive band on the forehead in order to keep the edges of the incision apart.

The correction of the ectropion is even more simple than the correction of the deformity of the face. Here again overcorrection is absolutely necessary. The lower lid must be kept in an exaggerated position of elevation for a period of two weeks at least. This is accomplished by placing fine silk-sutures in position, as indicated in Fig. 446. An incision is then made directly in front of the border of the infra-orbital bone, as shown in Fig. 446. The skin and fascia are then dissected loose, exposing a raw surface 4 cm. long and 2 cm. wide, as shown in Fig. 447. The lid is then carried upward over the eye by means of three silk sutures, and fastened in this exaggerated position by tying them over a rubber adhesive strip fastened to the patient's forehead, as shown in Fig. 448. The rubber adhesive strip is reinforced in order to increase its security by a second strip, as shown in Fig. 448.

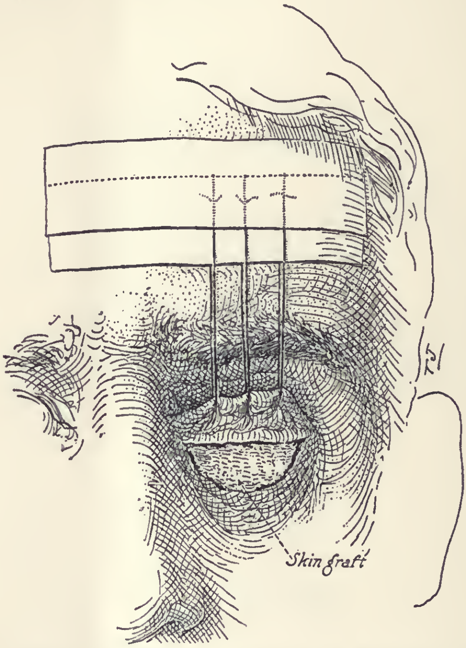

Fig. 448.—Operation completed. A Thiersch skin-graft has been applied over the exposed raw surface and a second adhesive band applied over the first to fix the stitches.

A Thiersch skin-graft is carefully cut from the patient's thigh, in the exact form and size to which the skin has been retracted, as shown in Fig. 448. The skin-graft is placed directly upon the fresh wound and very carefully adjusted. No dressing is placed over this skin-graft, but it is protected against trauma by means of a wire splint extending from the forehead to the cheek and nose.

The silk sutures are kept in place for two weeks, so that no motion of the eye can cause a disturbance of the skin-graft. In a week or ten days this will have healed entirely, and then the ligatures will be cut and the eyelid will recede a little, but not sufficiently to overcome the correction. The eye will again remain thoroughly covered, the ectropion will disappear, and the slight deformity caused by the skin-graft will soon become much less noticeable.

CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

HEMATURIA AND PURPURA

Summary: A case of painless, profuse hematuria—method of examination—demonstration of the pathology; analysis of the literature bearing on the relation of hematuria to purpura, on the general features of the disease, the differential diagnosis, common diagnostic errors, etiology, and pathologic anatomy; complete bibliography.

MY interest in the subject of hematuria occurring in purpura was stimulated by the following case, which was kindly referred to me by Dr. D. B. Phemister in September, 1917, because of the presence of painless profuse hematuria.

The patient was first admitted to the Presbyterian Hospital two years ago, when Dr. Phemister operated on him for osteomyelitis of the head and neck of the femur. Last spring he had a rash on the legs, which was called urticaria by his physician. The eruption disappeared in three or four days and was followed by hematuria, which in turn disappeared in a week or ten days. Since this first eruption the patient has had four or five similar attacks, each accompanied by hematuria.

After recovering from his operation he left the hospital and was sent to a sanitarium, where he remained for a month and a half. While there he had one of his attacks; he noticed masses of red pin-point spots around his ankles and lower legs. With rest in bed these spots began to get paler within three or four days. At the same time the patient noticed that he passed blood in the urine; this hematuria persisted for a week or a little longer, during which time the spots had nearly entirely disappeared. The urine then became clear and the spots returned; they remained for a week or more, when they again began to disappear and blood was again noticed in the urine. This same sequence of alternate petechiæ and hematuria went on for eight months, six of which the patient spent going to school and the remainder in vacation.

His present attack, for which he was admitted to the hospital this time, began on Monday, September 3, 1917, following his return from a trip to Fort Sheridan. Blood in the urine has been present continuously since September 3, 1917, but it seemed to be decreasing in amount. There was some slight burning on urination on the 5th which had not been present before. Patient urinated from three to four times daily, and, as a rule, once at night. Pain in the back was present for the first time during the present attack. It was of a dull, aching character, and was located in both lumbar regions. The patient has had attacks of nausea through the day, but did not vomit. At the onset of the present attack he vomited, and thinks that he also had some fever. Headache, frontal and very severe, bothered him from the onset until after he had been in the hospital for some time.

The patient states that he felt very weak during the eight months that he was at home. He was never dizzy nor did he notice any blurring of vision, and yet at times he says he thought he would fall. There was never any swelling of the face or ankles, and he had no pain except an occasional "stomach ache." He says he vomited frequently while in the hospital before.

His appetite is good, he sleeps well, his bowels are regular, he has no sore throat, cough or night-sweats, and there is no history of a similar ailment in any other member of the family.

Physical Examination.—Head and neck negative. Chest: Heart and lungs negative.

Examination of the abdomen reveals the upper border of the liver in the fifth interspace; the lower border is about a fingerbreadth below the costal margin. The spleen and left kidney are not palpable; whether or not the right kidney is palpable is doubtful. There is a slight tenderness on fist percussion over each kidney posteriorly, most marked on right side.

Examination of the skin eruption on September 7th, four days after admission, revealed a pink-red, maculopapular, discrete, and confluent rash upon the lower third of each leg, most marked on the anterior surface of the ankles. It was accompanied by itching, and had a tendency to disappear when the patient was warm, usually being absent in the morning and reappearing when the extremities were exposed to cold. On September 19th these purpuric spots were present over both malleoli of the left foot, along the inner aspect of the foot down to the sole, on the dorsum of the foot, and a few hemorrhagic spots were seen on the toes.

The urine was alkaline, contained both nucleo- and serum albumin; specific gravity, 1014; there were a few granular casts and leukocytes, some erythrocytes, and blood macroscopically.

Blood examination showed 4,460,000 erythrocytes, 7600 leukocytes, hemoglobin 47 per cent.; blood-pressure, systolic, 110; diastolic, 55.

Cystoscopy revealed several small patches of submucous hemorrhage in the base and apex of the bladder. Many of these areas of ecchymosis were found around or in front of the left ureteral orifice. They varied in size from the head of a pin to ½ inch in diameter.

Ureteral Catheterization.—Easy and without obstruction. Prompt flow of urine from each side. Examination of catheterized specimens showed:

Right kidney, 1020 leukocytes per cubic millimeter.

Left kidney, 400 leukocytes per cubic millimeter.

Bladder, 250 leukocytes per cubic millimeter.

Cultures.—Right kidney, sterile; left kidney, sterile; bladder, sterile.

Examination of all specimens negative for tubercle bacilli.

Roentgenography was negative for the presence of calculi in the urinary organs.

From a review of the literature on this subject, one is impressed by the lack of urologic reports, both as regards the number of cases that have been reported by genito-urinary surgeons as well as by the scarcity of cases reported in which a complete genito-urinary examination was made. Doubtless this is, in a measure, due to the fact that most of these cases are seen by the internist or family physician, and, therefore, careful urologic study of the cases is not carried out.

In a somewhat brief review of the literature I have collected reports of 90 cases. In this group of cases I have been able to find reports of cystoscopic examinations in but four instances, those reported by Kidd, Walsh, Nelson, and Blum.

As a rule, the origin of the bleeding is said to be from the kidney, but in some cases at the time of examination the kidney had doubtless stopped bleeding, so that the only evidence when cystoscopy was carried out was the presence of bladder ecchymoses.

Blum has described, under the name of purpura hemorrhagica, a condition which occurs in men and women of different ages, generally after some affection of the mucous membranes, as a cold, influenza, or angina. Cystoscopic examination at this stage shows multiple hemorrhages of the mucous membrane scattered over the whole of the inner surface of the bladder, not confined to the trigone and base of the bladder. These hemorrhagic spots later become transformed into hemorrhagic erosions and finally into ulcers. Nowhere in his report does he mention the presence of other manifestations of purpura, except that the patients with purpura vesicæ are subject to attacks in the spring and fall.

Blum, in describing the condition known as "ulcus simplex vesicæ pepticum," calls attention to the cystoscopic findings. He says that cystoscopic examination showed multiple hemorrhages of the mucous membrane scattered over the whole of the inner surface of the bladder, *not* confined to the trigone and base of the bladder. The hemorrhages are bright red, dark red, or bluish black, according to the stage of the affection. These hemorrhagic spots later become transformed into hemorrhagic erosions and finally ulcers. All spontaneous ulcerations of the bladder are preceded by hemorrhagic lesions. The formation of ulcers from hemorrhagic lesions is due to the peptic properties of the urine. These ulcers of the bladder are analogous to ulcer of the stomach. Prophylactic treatment and treatment in the early stage consists in keeping the urine alkaline.

Nelson's case was that of a dentist, aged thirty-six. The trouble began as a scanty discharge of pus from the urethra, lasting three or four days. Then the discharge assumed a bloody character. Urethroscopic examination showed slight congestion of the mucous membrane throughout the entire length of the urethra. In the first inch of the canal there were numerous bleeding pin-point openings, red spots, and a pale, flat papule about the size of a split pea, surrounded by a few dilated capillaries on the lips of the meatus. A cystoscopic examination was then made, which showed a hyperemia of the trigone, minute punctate spots, and dilated capillaries at the internal urethral (vesical) opening, which explained the terminal hematuria. The rest of the bladder appeared to be normal.

Walsh's case was that of a female, aged twenty-three, who consulted the author because of intermittent hematuria and cystitis. Cystoscopic examination showed bladder capacity normal. The mucosa throughout, but particularly that covering the fundus and lateral walls, was studded with punctate hemorrhagic areas, none of which at the time was actively bleeding, but which showed that bleeding had recently taken place therefrom. The urine for several hours previous to the examination had not contained blood microscopically. Catheters were placed in the ureters, urine from both kidneys being obtained. The urine from both sides appeared normal, and it was evident that the source of blood previously found was from these hemorrhagic spots in the bladder mucosa.

Kidd reported a case of purpura of the bladder that occurred in a girl aged twelve. The onset was characterized by sudden desire to pass water and severe pain in the left iliac region. The patient had a sore throat for some days before the onset of the hematuria. *Cystoscopy:* Scattered over the fundus and trigone were seen patches of submucous hemorrhages, varying in size from a pin-head to a six-pence. The patches were of all shapes and sizes, some linear, some stellate. Kidd is inclined to believe that his case was one of secondary purpura, confined to the bladder and arising in a bacterial infection of the tonsil, though it is possible to look upon it as a case of Werlhof's purpura.

Many of the cases of purpura show, upon careful study of the urine, the presence of a coexisting nephritis. In a large number of the cases reported nothing is contained in the findings with reference to the presence of nephritis. That this may be more common than is generally supposed is evidenced by the reports of Osler, who reported nephritis in 7 cases. In the case reported in this paper, repeated examinations of the urine showed the presence of granular casts.

According to Hutinel, the nephritis, like the purpura, generally results from intestinal infection, changes in the liver, or disturbances of the blood-producing function. Nothing is more common than to see several reinfections in cases of intestinal infection. Each of these attacks serves to aggravate the renal condition. Many cases of persistent nephritis of unknown origin, he thinks, result from digestive disturbance, particularly the nephritis of purpura. Of course the coincidence of scarlet fever and purpura might well give rise to a particularly severe form of nephritis.

He reports 3 cases of an associated nephritis in purpura. One case was that of a little girl of three and a half years who was admitted to the hospital with scarlet fever. In addition, she had purpuric eruptions on elbows, feet, and legs, with hematuria and albuminuria, vomiting, and abdominal pain. She was given Witte's serum, following which the hemorrhages ceased, and she was discharged from the hospital with an almost normal urine.

The second case was in a boy of five who had purpura, albuminuria, hematuria, and bloody stools. He developed scarlet fever while in the hospital under treatment for the original trouble. Recovered, but still had albumin in urine two and a half months after onset.

The third case was that of a little girl with a rheumatoid purpura complicated with intestinal hemorrhage and hematuria followed by nephritis, from which she died eighteen months later.

The author states that the mortality in the nephritis of purpura is quite high, as this form of nephritis tends to become chronic. Scarlatinal nephritis, on the other hand, is seldom fatal.

Burt reports a case of a boy of eleven, who one year after the removal of tubercular glands of the neck began to bleed from the gums. This was followed by the appearance of hemorrhagic spots scattered over the body, but mostly on the extremities. Urine showed abundant hyaline and finely granular casts, moderate amount of cellular and coarsely granular casts, trace of albumin, few red and white blood-cells. He continued to bleed from gums, and also passed much blood from bowels and vomited blood. He died on the tenth day.

Eichhorst reports 3 cases of patients suffering from a form of Werlhof's disease which he does not find described in the literature. He calls it the chronic nephritic form of purpura hemorrhagica. They had the typical signs of Werlhof's disease, to which a hemorrhagic nephritis was added. They recovered from all signs of the disease except the hemorrhagic nephritis, which remained for years and resisted all forms of treatment. One case was in a girl of fifteen, one in a man of twenty-five, and the third in a boy of eighteen.

In looking up the literature on the subject, he found that in Hebra and Kaposi's "Lehrbuch der Hautkrankheiten" there is a footnote saying that Kaposi, in a case of recurrent peliosis rheumatica, observed periodically recurring kidney hemorrhages which were not coincident with the purpuric attacks.

As a result of a study of his cases, Eichhorst concludes that chronic hemorrhagic nephritis is most apt to appear in those cases of hemorrhagic purpura which have a chronic course and show a tendency to recurring attacks of purpuric eruption. There are two forms of this chronic hemorrhagic nephritis, those of the interstitial and parenchymatous types. Uremia is not seen in these patients, so that the prognosis as to life may be given as good, but as to complete recovery very doubtful. He says the causes of Werlhof's disease are unknown.

Osler reports 7 cases of acute nephritis with purpura. One case, in a girl of fifteen, which began as an erythema over the cheeks and nose, with puffiness of one small joint and edema of one eyelid. Three months later she had a severe attack with areas of angioneurotic edema, intense swelling of the face, and an acute nephritis, which proved fatal seven months after the first appearance of the erythema.

The second case was in a boy of fourteen, who was admitted to the hospital with the diagnosis of appendicitis. One week before admission he had a purpuric eruption on the legs with high-colored urine. He had never had any similar attacks, though he had had irregular colicky pains at times. Osler, in showing the case to his class, remarked how interesting it was to see a case of acute hemorrhagic nephritis without any diminution in the amount of urine, no swelling of the face, and no edema. Recovery.

The third case was in a boy of twelve. It began as an otitis media followed by an extensive purpuric rash with acute nephritis. Subsequent death from meningitis as a result of the otitis media.

The fourth case was in a girl of six, with purpura, pains in the knees and ankles, acute nephritis with blood, albumin, and tube-casts in the urine.

The fifth case was in a woman of twenty-four. It began with an erythema of nose and cheek, extending to elbows and arms in the form of wheals, with some purpuric spots, followed by pneumonia, but no kidney symptoms. Eight months later she developed an acute nephritis and died in a uremic convulsion. The acute nephritis came on without any special exposure. No skin rash.

The sixth case was in a boy of five. Began as an acute otitis, followed by hemorrhage from the bowels, purpura, and acute nephritis. Recovery.

The seventh case was in a physician of twenty-nine. When a boy he had an attack of hemiplegia with aphasia, lasting a week. Within a year he had five or six attacks. At the age of twenty-eight he had a mild attack of rheumatism, with angioneurotic edema of the upper lip and some urticaria. The next year he had attacks of abdominal colic with pain in the leg, purpura, and urticaria. The following year he had hematuria and albuminuria, which the patient himself considered as only a part of his old trouble.

Prentiss reports a case of purpura hemorrhagica rheumatica with nephritis present in one attack.

Sutherland describes 2 cases of Henoch's purpura in children with nephritis. One was in a boy of three and the other in a girl of ten. Both cases recovered.

Thacher, in discussing purpura, says that nephritis is not an uncommon accompaniment, with marked glomerular changes and much epithelial destruction.

Cases of purpura are often associated with attacks of abdominal pain. Because of these attacks of abdominal pain errors in diagnosis have occurred, so that the patients have been unnecessarily subjected to surgical operations. That these mistaken diagnoses and further unnecessary operations have been recorded is evidenced by the 8 cases reported in the literature.

Barling, in the British Medical Journal for 1913, reports a case of a boy aged four. The mother gave a history of attacks of abdominal pain accompanied by rash. He was admitted to the hospital twenty hours after the beginning of the last attack of pain. Intussusception was suspected and the child operated. At operation the appendix, cecum, and part of the ileum were found invaginated into the colon, and these organs showed extensive interstitial hemorrhage, and some inches of the small bowel were black and apparently gangrenous. The part of the ileum above the obstructed portion was distended for some distance by dark, blood-stained fluid lying in its lumen. The gangrenous portion of the bowel for a distance of 12 inches was excised. Examination of the piece of bowel removed showed that the portion next to the ileocecal valve was gangrenous for some 4 or 5 inches; above this were two short segments, each about 2 inches long, with thickened walls, and separated by a portion of apparently normal bowel. On section through the thickened segments the bowel wall was found infiltrated with blood, measuring nearly $\frac{1}{4}$ inch from the peritoneal to the mucous surface. The patient recovered.

Greig, in the Scottish Medical and Surgical Journal for 1908, describes a case of Henoch's purpura simulating intussusception in a boy of nine years and four months in whom operation was performed. The tumor found before operation proved to be due to a great congestion of the lower end of the ileum, which projected as a distinct collar into the cecum. There was no obliteration of the lumen, for the finger could easily be entered through it by inverting the bowel.

Harrington, in the Boston Medical and Surgical Journal for 1905, reports a case of angioneurotic edema in a girl of twenty-six, who was admitted to the hospital with symptoms of gallstones. At operation no hemorrhagic areas were found in the intestinal walls, but at a point within a short distance of the ileocecal valve there was a cylindric enlargement of the ileum, increasing the bowel circumference to twice its ordinary size. The engorgement of the intestines and the free fluid were explained by the violent peristalsis brought on in the effort to force down the lesion which was actually in the intestinal wall.

Jacobson, in the Medical Record for 1903, describes a case of hemorrhagic appendicitis as the first manifestation of purpura hemorrhagica. The patient was a woman of thirty-seven, who was admitted to the hospital with symptoms of appendicitis. At operation the appendix was found to present numerous areas of hemorrhage into its substance. After operation she had profuse nasal hemorrhage and petechiæ appeared on legs and abdomen, but there was no hemorrhage from the bowels or kidney. The patient made an uneventful recovery and had no recurrence of the hemorrhage.

Mitchell, in the Annals of Surgery for 1913, describes 2 cases of purpura with symptoms indicating surgical operation and in which operation was performed. One case was a boy of twelve, admitted to Dr. Crook's service in 1905. He had been ill for a couple of days with acute abdominal colic, slight fever, and vomiting. There was general abdominal tenderness and rigidity, most marked in the right iliac region. Dr. Crook operated and removed the appendix. Mitchell saw the boy in consultation three days later, because the colic had not cleared up and the findings in the appendix did not explain the symptoms. The appendix was congested and its superficial vessels distended. Inspection of the last 2 feet of the ileum showed that it also presented the same appearance, and that the Peyer patches all seemed enlarged, dark in color, and projecting from the surface of the bowel, much resembling the condition seen in typhoid fever. No actual hemorrhage into the peritoneum or viscera was found, but the whole peritoneum was congested. Examination at the consultation showed slight abdominal distention, with no actual spasm and no sign of peritonitis. Legs were covered with purpuric spots. No spots on the arms or trunk and no joint tenderness was present. A diagnosis of Henoch's purpura was made and the condition cleared up rapidly.

The second case was that of a girl of five. The history was that of abdominal disturbance, beginning shortly after birth, and the vomiting of blood at the age of two. At the age of four she had an acute illness, with a temperature of 103° F., great abdominal pain, and intestinal hemorrhages for several days. One month later she had a similar attack and was operated. At operation no abdominal findings were present, except a general intestinal distention. One year later she had a similar attack of pain in which blood was vomited. She was brought to the hospital in a state of collapse, with a temperature of 96° F. and pulse practically uncountable. With the administration of horse-serum there was a complete cessation of the hemorrhage and she rapidly recovered. After that she had one or two mild attacks, characterized by the vomiting of bright blood and the presence of bright blood in the stools. With each attack there were purpuric spots on the limbs, intense abdominal pain, and pain in the joints.

Osler, in the American Journal of the Medical Sciences for 1914, reports a case of a girl of seventeen who was brought to the hospital because of severe recurring attacks of abdominal pain. An exploratory incision was made, but no cause for the trouble was found. Three months later she was admitted to another hospital in paroxysms of pain, with the knee-joints slightly swollen and tender, but no fever or skin eruption.

Readmitted to the hospital six weeks later because of severe colic and nausea. This time she had recurring attacks of bleeding from the nose and once bleeding from the gums, but no skin eruption. She remained in the hospital nine days and was discharged much improved.

Burrows, in the British Journal of Children's Diseases for 1904, describes a case of Henoch's purpura in which operation was performed with a probable diagnosis of appendicitis. On opening the abdomen the appendix was found to be normal. So far as could be seen the greater part of the small intestine was pale and nearly empty. Just as the abdominal incision was about to be sutured a portion of congested small intestine was seen. It was found to be the ileum a few inches from the ileocecal valve. The bowel showed several small petechial hemorrhages and some irregular patches of congestion, from which the blood could be expressed. Over the congested areas the peritoneum was sticky and had lost its gloss.

Next day a search was made for other petechiæ and some small purpuric spots found. Further questioning of the mother elicited a history of a purpuric eruption before the abdominal attack.

The cases reported by Harrington, Mitchell, Osler, and Burrows were all erroneously operated on. In addition to these cases, Sutherland reports one in a boy of five, who was operated for intussusception, but the condition not found. The case proved to be one of Henoch's purpura.

Mitchell calls attention to the fact that purpura very often simulates surgical conditions. He says the importance of the condition surgically lies in the fact that the abdominal symptoms may be so striking as to lead one to open the abdomen. He quotes the statement made by Pratt, that a review of the literature showed at least 6 patients who had been subjected to exploratory operation under this illusion, and he also calls attention to Jacobson's case of purpura, in which a hemorrhagic appendix was removed under the diagnosis of acute appendicitis.

Mitchell also says that, in looking over the cases of purpura where operation has been performed, one is struck by the fact that the chief seat of the lesion is in the ileum, especially the lower part, in the neighborhood of the ileocecal valve. All grades of lesions can be traced, from simple hemorrhage or edema to intussusception, gangrene, perforation, peritonitis, and death. From the data obtained on the operating-table a clear picture of the pathology can be drawn and the abdominal symptoms readily explained. In the cases of Crook and Burrows there was nothing more than congestion with localized small hemorrhages in the lower portion of the ileum. In the case of Harrington there was a definite ring of edema in the lower portion of the ileum, causing a local paralysis equivalent to a local obstruction. This readily explains the paroxysmal abdominal pain caused by the intestine attempting to overcome this obstruction and dragging on its mesentery with each contraction. Cook and Mills both saw several similar edematous rings at intervals along the ileum. Greig suspected intussusception in his case, and felt a tumor before operation, but when the abdomen was opened and the tumor delivered it proved to be a great congestion of the lower end of the ileum, projecting as a collar into the cecum without obliteration of the lumen.

Intussusception is by far the most frequent and most serious intestinal complication, and each step in its production can be seen in the various lesions described in operative reports. It is most often ileocecal, but may be enteric. Nobecourt reports one instance of perforation of the duodenum 15 cm. from the pylorus, and Silverman reports a death from gastric perforation. Aside from these two isolated accidents, the lesions seem to be pretty constantly confined to the lower ileum.

In a review of the literature, by no means exhaustive, Mitchell found 19 cases in which laparotomy had been performed. In 11 nothing was found which demanded operation, and in the majority of these intussusception was suspected—9 of these recovered; 1 died in eight hours; 1 later of pneumonia; 1 in three weeks of nephritis. In 8 cases intussusception was demonstrated at operation, 4 being treated by resection and 4 by reduction, with 3 recoveries by each method; 3 were unoperated, with 1 recovery, making 11 cases of intussusception.

In the majority of cases there is not absolute occlusion of the bowel; the intussusception is undoubtedly caused by a primary area of edema or hemorrhage, usually in the lower ileum, acting as a definite obstruction. In the presence of abdominal crises it is justifiable to assume the existence of such an area.

Pain is one of the important symptoms in the majority of cases of purpura. It has been found present in all the cases with gastro-intestinal symptoms and in many cases with joint symptoms, especially in those cases with an associated rheumatism or tuberculosis.

Bauch has described 3 cases of purpura hemorrhagica in chronic tuberculosis, in all of which the patients complained of pain in the joints coming on suddenly and simultaneously with the onset of the rash. In 2 cases the cutaneous hemorrhages were of the simple type. In the third case the patient's stools showed traces of blood, evidently suggesting purpura hemorrhagica proper. All 3 cases had edema of the extremities and diarrhea, and one showed, in addition, albumin and casts in the urine.

Bristowe reports 2 cases in boys of fifteen and ten years respectively, in which the illness began with pain in the bowels and melena. In both cases there was persistent hematuria, derived not from the urinary passages or reservoirs, but from the glandular substance of the kidney. In both from the beginning there was a recurrent purpuric urticarial eruption affecting mainly the extremities. In one case there was sponginess and bleeding from the gums and in the other case there was epistaxis. Both cases recovered.

Osler reports 13 cases of purpura hemorrhagica with pain in various parts of the body, of which 10 had severe abdominal colic, 1 pain in hips, 1 in knees, 1 both joint pains and abdominal colic.

Prentiss reports a case of purpura hemorrhagica rheumatica in a boy of thirteen, which began with swelling of all joints, pain, especially in knees and ankles, a purpuric eruption over entire body, and pain in stomach and vomiting. This attack cleared up on a diet of milk and Mellin's food. Six months later he had a second attack, with hemorrhages from bowels and bladder and in large patches into the skin.

Fifteen cases of purpura hemorrhagica with gastro-intestinal crises have been reported, 11 by Osler and 1 each by Binet, Bristowe, Sutherland, and Jacobson. In all of these cases there was present either hematuria or hemorrhage from the bowels. Nine were in males and 6 in females. Hematuria was present in 9 cases. In 4 cases it is stated that there were no urinary findings; in 4 these were not recorded. The other 8 cases showed microscopic blood, 6 of which also had albumin.

As to the cause of the abdominal crises in purpura Lavallee says it is unknown. Some authors consider them to be of nervous origin. He says that the slight inflammatory changes in the arterioles noted by Hayem and the lesions in the liver and the kidneys are of infectious origin, and that the nervous phenomena might also be explained by infection of indeterminate origin, possibly multiple. The small vessels are particularly affected, and this may lead to small hemorrhages in the skin, intestine, and meninges, which may end in necrosis. Such hemorrhages in the intestines undoubtedly explain the intestinal invaginations in the course of purpura. Intestinal spasm is frequent in abdominal crises, due to increased peristalsis caused by annular hemorrhages. This theory of an infectious pathogenesis would explain the frequency of purpura in cases of hereditary syphilis.

Couty was the first to try to explain the pathogenesis of the gastro-intestinal symptoms. He considered them nervous in origin. He did not think them due to brain infection. He said the symptoms in his cases were more like those of lead-colic, and concluded that they were due to the sympathetic nervous system.

Faisans, in a later work, considered that the origin of these symptoms was spinal and not sympathetic. Henoch published the first case where the gastro-intestinal infection was found to be the cause of purpura. Aiello, in 1894, also believed in this gastro-intestinal origin of purpura, and reported the case of a soldier in whom a purpuric eruption came out in the course of a very severe digestive disturbance. There are, however, undoubtedly two distinct classes of cases, those in which the gastro-intestinal disturbance causes the purpura and those in which the gastro-intestinal symptoms occur during the course of a purpura of other origin.

Calmels believes that the congestion of the gastro-intestinal mucous membrane, often accompanied by hemorrhage, and the subperitoneal ecchymoses certainly play a part in the production of the gastro-intestinal crises. It is hard to say whether the localization of the ecchymoses in such and such a region explains the clinical picture of the pain crises; that is, whether they simulate appendicitis, hepatic colic, etc. He concludes that the gastro-intestinal lesions do not entirely explain the crises, but that they are due, in part at least, to a reaction of the nervous system to the causative agent of the purpura.

Osler says that the anatomic conditions associated with the visceral symptoms are not well understood, but the changes in the gastro-intestinal canal at least are probably the counterpart of those which occur in the skin; namely, exudation of serum, swelling, hemorrhages, and in rare instances necrosis. At autopsy hemorrhages have been found in the internal organs.

Some authors claim that the purpura is caused by tuberculosis. Bauch finds the following facts in his cases to substantiate such a theory:

(1) The tubercle bacilli form colonies in the cutaneous vessels where they act as an irritant.

(2) The secreted or excreted tuberculous toxins contribute to the necrosis of the cutaneous vessels.

(3) The serum extravasated into the dependent portions, either by pressure exerted on some vein or lymphatic vessel, or when this is directly due to nephritis, produces in turn a pressure on the cutaneous vessels, which may act as a mechanical factor.

(4) In the later stages of pulmonary tuberculosis the viscera may undergo either hyaline, amyloid, or fatty degeneration, which aids in disintegrating the endothelial cells of the blood-vessels, producing necrosis of the endothelium and rupture; the fibrinogen-forming cells in the liver are also destroyed by

the morbid process, thereby producing diminution in the viscosity of the blood and also delaying its coagulation.

Herbert French maintains that general tuberculosis is not a common cause of purpura, and yet in a few instances extensive purpura has been the first, and, for the time being, the only symptom of an obscure illness which has ultimately turned out to be a general tuberculosis. The patient has generally been a child, and diagnosis has only been possible when the course of the case has been watched.

Brown says that purpura hemorrhagica rarely occurs in tuberculosis. In the last 1000 cases at the Adirondack Cottage Sanitarium but 3 cases have occurred. This corresponds to Cruice's report that out of 1626 ward patients at the Phipps Institute he was able to find only 8 cases of purpura. Mackenzie, in 200 cases of purpura, found it associated with tuberculosis only four times. Pratt, in 258 cases of purpura, both primary and secondary, found it associated with tuberculosis seven times.

Lavellee says that tuberculosis is found in many purpuric patients, and often in their family history. In one of his cases a brother of the patient had died of tuberculosis at the age of fifteen. In a second case the mother was tubercular, and in still another case the father of the patient died of tuberculosis. The patients themselves sometimes have tubercular lesions, such as lupus of the face, Pott's disease, and vertebral tuberculosis.

Burt reports a case of purpura hemorrhagica or morbus maculosis of Werlhof in a boy of eleven, who one year previously had been operated for tubercular glands of the neck. Two maternal uncles had died of tuberculosis.

Baudet states that while many authors think tuberculosis is not the cause of rheumatoid purpura, it is at least the soil on which it develops. Tuberculosis is found in many patients with purpura or in their antecedents. In his case, while the patient did not show any active signs of tuberculosis, both his father and brother had died of it.

Out of 35 cases of chronic purpura hemorrhagica reported by

Bensaude and Rivet, 7 occurred in individuals undoubtedly tuberculous. These authors say that in the presence of purpura, particularly in the recurring or chronic form, when the cause is not apparent, the clinician should by all means in his power look for some chronic tuberculous lesion, either of the lungs, glands, or some other part of the body.

The bowels and kidneys are not the only sources of bleeding in cases of purpura hemorrhagica. Blood is also frequently effused in the stomach, the intestines, the urinary passages, or the uterus, and occasionally in the bronchial tubes. Bleeding from the gums is a frequent associated symptom, together with hemorrhage from the bowels and the vomiting of blood. Emsheimer reports a case of hemorrhage from the urethra, and Fagge calls attention to the fact that epistaxis is the most frequent and usually the earliest hemorrhage from a mucous membrane. Lesegue reports a case in a girl of ten with profuse hemorrhages from nose, gums, throat, intestines, and bladder. Lewis had a case of bleeding from the mouth.

Sex.—The relation of sex to purpura hemorrhagica is still an open question. Fagge states that females are more subject to idiopathic purpura than males, and this applies particularly to children. Burt also states that it is somewhat less frequent in the male than in the female. From the cases studied in connection with this review of the literature, it would appear that the disease is more common in males, both in childhood and adult life. Of the 90 cases studied, 61 occurred in males and 29 in females.

Family History.—In the 90 cases studied only one instance of a family history of purpura is recorded. That was in a case reported by Burt. The disease occurred in a boy of eleven, two other children in whose family had recently had purpuric eruption on the lower extremities.

Changes in Blood—Coagulation Time, Blood-platelet Counts.—Minot, Hess, Steiger, Duke, Lenoble, Nobecourt and Tixier, and Ledingham discuss platelet count and coagulation time. Minot calls attention to the fact that there was usually a delayed coagulation time, while Hess says that the coagulation time of the plasma centrifuged for fifteen minutes is normal in purpura or but slightly prolonged. Steiger found a marked decrease in the coagulability of the blood.

In Minot's case the patient had an abnormally low platelet count, which he thought due to one or both of the following factors: (1) Some reaction, presumably a specific poison, taking place in the body which destroyed the platelets as fast as they were formed. (2) A localized aplasia of the platelet-forming elements of the marrow, which might have been due to some toxic phenomenon. This destructive process, perhaps toxic, anaphylactic, or of some other nature, seems to have been specific, because none of the other formed blood elements were involved. The anemia was easily explained by hemorrhage. There was no evidence of red cell destruction, as shown by the urobilin tests. The white cells were not affected.

The case was not one of aplastic anemia, *i. e.*, generalized aplasia of the marrow, because there was no leukopenia, no marked lymphocytosis, and there was always a high percentage of reticulated red cells. In cases with aplasia of the bone-marrow these cells are absent or very rare, and when increased probably signify activity of the red cell elements of the marrow.

The specificity of this reaction on the platelet simulates in every way animals injected with antiplatelet serum. In vitro the patient's serum caused no abnormal lysis or agglutination of normal platelets. Injections of patient's serum and blood into animals were negative.

There was usually a delayed coagulation time, a weak, non-retractile clot, associated with a delayed prothrombin time, which did not vary directly with the platelet count or clinical symptoms. The antithrombin was normal. The platelets were actively thromboplastic, as were extracts from the uterus. Very slight delay of coagulation occurred with the syphilis coagulation test. The clotting of the plasma with thrombin, as seen under the ultramicroscope, was normal.

The tourniquet sign was greatest when there were spontaneous purpuric lesions on the skin. The bleeding time varied with the platelet count, becoming longer as the platelets diminished. The bleeding time from the arm vein was shorter than from the ear, which was not due to a difference in the platelet count.

The essential treatment consisted of trying to replace the lacking platelets by eleven transfusions of normal blood, and by giving locally and subcutaneously thromboplastic substances which contain one of the active principles of platelets. Transfusion resulted usually, but not always, in temporary improvement in the patient's condition, associated with temporary rise in the platelet count. Thromboplastic substances were perhaps of benefit in temporarily controlling hemorrhage. In spite of the treatment the patient died thirteen months after the beginning of the illness.

Hess also states that typical purpura is characterized by marked diminution in the number of platelets. This may be due either to lack of formation of these cells or to their increased destruction.

Duke examined a series of 13 cases, and every case of pathologic hemorrhage observed which presented a certain clinical picture (purpura, bleeding from mucous membranes, a prolonged bleeding time, a normal coagulation time, and a firm blood-clot) had enormously reduced platelet counts. The tendency to hemorrhage vanished when the platelet count rose to a certain point and reappeared when the count fell.

He thinks purpura hemorrhagica is a symptom and not a disease. It has been observed complicating a varied set of diseases—in severe form in lymphocytic leukemia, hemorrhagic smallpox, tuberculosis, nephritis, benzol-poisoning, aplastic anemia, and diphtheria. It is caused apparently by any agent which reduces the platelet count to a sufficient degree.

Lesourd and Pagniez believe that purpura is a blood disease, because the case they observed had a total disappearance of the blood-platelets. They are, however, unable to say whether it is due to a blood infection, a toxemia of special type, or to some cytologic change.

Nobecourt and Tixier, after a study of 4 cases, conclude that blood examination, coagulation time, and retraction of clot do not furnish any basis for classification of varieties of purpura.

Pathogenesis and Experimentation.—Krumbhaar and Musser have done some experimental work on rabbits and guinea-pigs to show the changes produced in experimental purpura. Having noticed that in acute hemorrhagic dyscrasia (purpura hemorrhagica, severe anemia, etc.), when purpura is present, a decrease in the resistance of the red cells to hypotonic salt solution frequently occurs, they were led to believe that there is a direct association between changes in the red cell resistance and the occurrence of purpura. Furthermore, as they have noticed the changes in the resistance only during the acute onset of purpura, or while the purpura was developing, and not during the subsidence of the symptoms, it occurred to them that the decreased resistance might be a factor in the pathogenesis of the purpuric lesion.

As a result of their experiments on rabbits and guinea-pigs they are inclined to believe that the hemolytic factor is a characteristic of the antiplatelet element of the serum, and in part at least responsible for the production of purpura. If this is so, the suggestion naturally follows that the pathogenesis of purpura may be dependent on a substance which destroys the platelets and at the same time decreases the resistance of the erythrocytes and thus hastens their destruction. Through the decrease of platelets thus caused would result a loss of thrombogenic substances and the characteristic prolongation of bleeding time; but the real basis of the pathogenesis of purpura would be the hemolytic substance which destroys the plates and weakens the red cells.

Hutinel brings out the point that in almost all purpuras there is hepatic glycosuria. Degeneration of the liver is the cause of the purpura appearing in old tubercular patients. It is known that patients with cirrhosis have a tendency to hemorrhage, and that phosphorus and arsenic intoxication, which affect the liver cells, produce hemorrhagic symptoms. Purpura has been produced in animals by bringing about changes in the liver and nervous system.

Lippmann thinks that purpura is bacterial in origin, though this has never been demonstrated. He thinks it is caused by some specific micro-organisms not yet isolated, and that the virus circulating in the blood produces small emboli and hemorrhages, which explains similar findings in typhus, colisepsis, and endocarditis maligna.

Burt says that the proximate cause of purpura hemorrhagica is believed to be a hyaline and amyloid degeneration of the walls, both intima and adventitia, of the blood-vessels, with ultimate hemorrhage, and by rupture of the vessels rather than by diapedesis. It seems probable that any unusual pressure of the circulation against the vessels previously weakened by degenerative changes would be sufficient to precipitate the extravasation.

Cannata thinks the purpura is due to some organ having a mechanical influence on the circulation; that is, the suprarenal capsule. It is known that the suprarenal capsule produces a substance which has a stimulating action on the musculature of the heart and blood-vessels, and maintains the necessary tone of these organs. This substance—adrenalin—also has a neutralizing action on toxins circulating in the blood. Any disturbance in the normal secretion of these capsules brings about disequilibrium in the circulation and aggravates any toxic infectious process. He concludes that for the production of purpura it is necessary for the suprarenals to be affected by some infection of toxi-infection. Di Giuseppe also believes in the relation of the suprarenal capsules to the production of purpura, saying that he performed experiments in which he found that after the suprarenal capsules had been injured, either mechanically or chemically, when pathogenic germs of any sort were introduced into the circulation purpura was produced.

Tice says that the infectious etiology of purpura is evident from the arthritis, the cutaneous manifestations, the abdominal disturbances, the leukocytosis, and the occasional positive blood-cultures.

Osler says the cases have a dual etiology, infectious and metabolic. Purpura, with or without erythema and exudative lesions, may follow gonorrhea, otitis media, parturition, phimosis, and local lesions of the skin. The rheumatic poison is believed to be responsible for a large group. The bacteriologic examination of these cases is not very satisfactory; no unanimity has been reached as to the organism. On the other hand, there is a large group in which the lesions are an expression of perverted metabolism. Chronic angioneurotic edema, urticaria, and some forms of purpura are possibly anaphylactic phenomena in persons sensitized for certain protein substances. It is interesting to note that experimental sensitization may be transmitted.

The diverse localization, the variable character of the exudate, now serum alone, now blood or blood and serum together, are points that are not yet explained. The actual exudate is conditioned by the epithelial cells of the capillary walls, damaged by a circulating poison, as is so well shown in experiments with snake venom. But it may only be some such subtle change in the blood-serum as takes place in the peripheral circulation in paroxysmal hemoglobinemia. Before long the anaphylactic key will unlock the mystery of these cases. The malignant purpura of the specific fevers and of the rare primary form may be anaphylactic phenomena.

Babes produced hemorrhagic infection in animals with bacteria isolated from the gums of scorbutus patients. He concludes, from a series of autopsies in which he found putrid pharyngitis, amygdalitis, and bronchitis, that morbus maculosis werlhofii is an infection.

Lee and Robertson produced typical purpura hemorrhagica experimentally by inoculating guinea-pigs with antiplatelet serum, subcutaneously, intraperitoneally, and directly into the heart. There were numerous and profuse hemorrhages, a greatly delayed bleeding time, a marked diminution in the number of platelets, and a normal coagulation time, but no retraction of the clot. A histologic study of the different organs showing hemorrhagic areas gave no information as to the manner in which these lesions were produced.

It was thought that some light might be thrown on the mechanism by which the hemorrhages were produced in this condition by observing the local effect of antiplatelet serum on the small blood-vessels of the mesentery. A guinea-pig was etherized, the abdomen opened, and several loops of the intestine spread out on gauze moistened with warm salt solution. One c.c. of antiplatelet serum was dropped slowly into one of these loops. The only local effect observed during the hour that the test was carried on was a moderate congestion of the area to which the serum was applied. However, at the end of forty-five minutes, several small hemorrhages were seen in two of the larger mesenteric glands and others could be produced at will by trauma. Soon petechiæ were observed on the abdominal wall and intestine in areas quite distant from the point at which the antiplatelet serum had been applied. Some of these spots began to ooze. The bleeding time determined at this stage was twelve minutes. Death occurred shortly after this, and autopsy revealed frequent infarcts in the lungs. The same result was obtained in another animal.

Thacher says that the number of platelets in the circulating blood may be experimentally reduced by injections of albumose. Moreover, injections of serum from another species will produce a gathering of platelets into masses forming thrombi. Also, sera destructive to platelets may be produced by the usual methods of experimental immunity.

Pratt, in discussing the pathogenesis of purpura, says that the blood-vessels are certainly concerned in its production, but the changes in them may be secondary to the changes in the blood. Probably a generalized vascular injury plays an essential part in the production of purpura, but the nature of the changes in the vessels is unknown.

Fagge says that whatever the ultimate cause of purpura is, it is probable that the immediate cause is rupture of a blood-vessel from disease of its walls. It is probable that there is always actual rupture of the vessels, not a diapedesis of red corpuscles.

Wesson reported a case in which he considered gonorrhea the etiologic factor, as there had evidently been a very malignant gonococcal infection, which had spread to the peritoneum and caused adhesions, with resultant coprostasis and autointoxication.

Weil and McMeans report a case of bacteremia with purpura, in which cultures of the Bacillus lactis aërogenes were obtained during life from the blood, urine, and prostatic secretion. The purpura, although a late manifestation, was the result of this infection. They concluded that the urethra was the point of entrance of the infection.

Romanelli describes a case of purpura hemorrhagica in a man of twenty-six, in which he cultivated from the blood a streptococcus which produced hemorrhage when inoculated in animals.

Mackenzie says that it is certain that cutaneous hemorrhages are sometimes determined and in all probability primarily caused by nervous influences, as in the cases of purpura occurring in conjunction with the lightning pains of tabes and in connection with certain neuralgias. The mechanism of the hemorrhages in such cases is purely conjectural, but it seems most probable that by acting on vasomotor centers it produces variations of vascular pressure under which the blood-vessels give way at the points of least resistance.

Venous stagnation also plays a rôle in the production of purpura. Other factors are changes in the quality of the blood, such as decrease of red corpuscles, increase of white corpuscles, deficiency or excess of some of the saline constituents, alterations in the specific gravity, deficiency in fibrin-forming elements. Diminution of support to the vessels by the surrounding tissues may also be a factor. This occurs in those who have wasted much from disease, in the loss of elasticity and vascular degeneration of the aged, and in the newborn. Albuminuria is of rather frequent occurrence in purpura. It occurs in both febrile and non-febrile cases, and corresponds with the statement that in fatal cases the kidneys are frequently found diseased.

Narizzano, Elliott and Kaye, Roux, Stelwagon, Lenoble, Bauch, Coutts, Adami and Nichols, and Hanns have also discussed the pathogenesis of purpura.

Autopsy Findings.—In a few of the cases reported postmortem examinations were made and the findings are quite interesting.

Osler saw the kidneys of a typical case in the service of Dr. W. T. Watson, in which death occurred with dropsy at the end of the sixth week from the outbreak of purpura. There was no endocarditis, the spleen was greatly enlarged, *the kidneys were enormous, each measuring 12 x 7 cm.* The cortices were pale, the striations distinct, and the glomeruli stood out as translucent nodules like miliary tubercles. There were a few small hemorrhages. In addition to the extensive degeneration of the epithelium the tubules were filled with desquamated cells, hyaline casts, and red blood-corpuscles. The glomeruli showed remarkable changes. Every tuft was much compressed within by a new growth of the capsular sheath, forming a crescentic mass. Dr. McCallum says that this is a type described as *adhesive glomerulonephritis*, in which, with great proliferation of the epithelium, there is also a new growth of connective tissue within the capsules.

Roux describes a case reported by Moussous in 1891. The case was that of a child of thirteen with rheumatoid purpura and hematuria, followed by albuminuria and death from uremia. On autopsy the kidney capsule stripped easily; macroscopic appearance was that of a large white kidney, though the enlargement was not very great. Histologic examination showed the changes of a diffuse nephritis, involving all the tissues of the organ, glomeruli, connective tissue, tubules. Some of the glomeruli showed marked fibroid degeneration with fusion of the vascular loops; the capsule was considerably thickened and infiltrated with cells. There was a very marked periglomerulitis, with abundant cells around the vessels and in the intertubular spaces. The convoluted tubules, many of which were dilated, contained numerous hyaline casts. Their epithelium was broken down, the cells swollen and very granular; epithelial débris filled the lumen of the tubules. In preparations treated with osmic acid fatty degeneration of the epithelium could be seen. Henle's loops and the straight tubules were much less changed, but some of them were filled with red cells. At other places there were small interstitial hemorrhages. No signs of amyloid degeneration were found.

In the few autopsies that have been reported the changes were generally those characteristic of the large white kidney. All the elements of the kidney have been involved; that is, there was diffuse parenchymatous nephritis. The macroscopic appearance has shown only enlargement or sometimes small hemorrhagic spots on the surface.

Lewis reports a case of Werlhof's disease in a laborer aged twenty-nine, which began with bleeding from nose and mouth and then the appearance of purple spots. The urine was filled with red blood-corpuscles and contained 40 per cent. of albumin in volume. He died one week after admission. Autopsy showed heart muscle intensely anemic; ventricle moderately dilated with few hemorrhages in subendocardial tissue; valves normal. Spleen was dark colored in spots and twice normal size; kidney capsule not adherent; intensely anemic, with extensive hemorrhages around the pelves. Stomach showed extensive hemorrhages in mucous membranes; mucous membrane of upper duodenum pigmented. Suprarenal capsule fatty. Numerous hemorrhages over anterior peritoneum and a large retroperitoneal hemorrhage covered the entire posterior surface of the body. Liver and pancreas intensely anemic. Intestines: Mucous membrane blood stained, otherwise normal. Culture of blood from heart showed Staphylococcus pyogenes albus.

Mackenzie says that on postmortem examination the most important changes, aside from hemorrhages, are in the kidneys and lungs. Slight degrees of diffuse or parenchymatous nephritis are relatively common. Congestion and edema of the lungs are frequently present and are often the cause of death.

Cannata describes a case of purpura hemorrhagica in an infant of eighteen months, in which autopsy showed tuberculosis of various organs, but nothing noteworthy in the kidney. The suprarenal capsules showed a vacuolization of the cells in the cortical zone. In the medullary zone were foci of punctate hemorrhages. The cells in this zone were granular, the nuclei pale, the protoplasm vacuolized and granular.

In the case reported by Weil and McMeans postmortem examination showed the bladder small, walls somewhat thick, and the mucous membrane everywhere dotted with bright red hemorrhages, the majority of pinhead size. On the surface of the kidneys were many small gray areas about the size of a pinhead. In the left kidney was one larger yellow area surrounded by a hemorrhagic zone; cortex and medulla not well defined.

Fagge and Pye-Smith report the autopsy findings in the case of a man dying suddenly of apoplexy after a week's illness of purpura. There were extensive ecchymoses over the whole body and in the mucous membrane, particularly in the mouth, esophagus, stomach, and bladder. Of the solid viscera the kidney alone was hemorrhagic, but blood was effused under the pericardium.

In Binet's case petechial hemorrhages of stomach and intestines were found, but the kidneys were normal.

Hutinel's case showed large white kidneys, typical of chronic parenchymatous epithelial nephritis.

Jacobson reports the autopsy findings in a case published by Henoch in 1874. The case was one of purpura with albuminuria, and death followed from peritonitis. At autopsy numerous superficial ulcerations of the intestinal mucous membrane, covered with croupous and diphtheric exudate, were found.

In Sutherland's case of intussusception and purpura in a girl of seven autopsy showed the intussusception, the cecum, and part of the ileum being invaginated into the colon for about 4 inches. The peritoneum was covered with pus.

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CLINIC OF DR. CARL BECK

North Chicago Hospital

RECONSTRUCTION OF EARS AND NOSE

Summary: A patient presenting marked congenital deformities of the face and ears; correction by repeated plastic operations; end-results.

Among the more frequent ear reconstructions of peace times are those made necessary by congenital defects; abnormalities of the ear are relatively common, and we find all degrees, from total absence to the presence of some slight deformity of an otherwise perfect ear.

The following case is illustrative of one of the extensive types of physical defects of ears, nose, and face which come under the observation of the plastic surgeon.

E. McN. was referred to me by his physician for plastic reconstruction of ears and nose. His external appearance was such that he would create curiosity with every observer, as there was a perfect contrast between age and appearance. His age is sixteen, his face looked like that of an old man, his nose was exceedingly large, with its tip hanging over the upper lip. His ears were malformed; there were two irregular flaps of skin which indicated where the ears should have been. He covered these defects with his hair, which he combed over his ears. No external meatus nor any indication where the meatus should be was present. There were a few cartilaginous nodules, irregularly distributed around and in that small lobe of skin which indicated the remnant of the ear. The hearing was somewhat defective, but evidently the inner ear was normal, inasmuch as the boy heard fairly well when talked to in a loud voice and understood, but his speech itself was defective, and only after a time did we become accustomed to the same and understand it, although it was absolutely non-understandable at first. (Both of these conditions have, as we will state later, improved in course of treatment.)

His malar bones were defective. On the right side there was still an indication of a malar bone. On the left side it was totally absent. There was a depression instead of a prominence in the region of the malar bone. The eyes, on account of this deformity, had a peculiar slant, with the external corner much lower than the internal, quite the opposite of the condition which we see in the Mongolian race. His mouth was deformed in the manner which is so characteristic of the prognathic type of skull, namely, the upper jaw projected considerably, the roof of the mouth was high and the arch narrow, the front of the upper jaw projecting over the lower, which receded conspicuously.

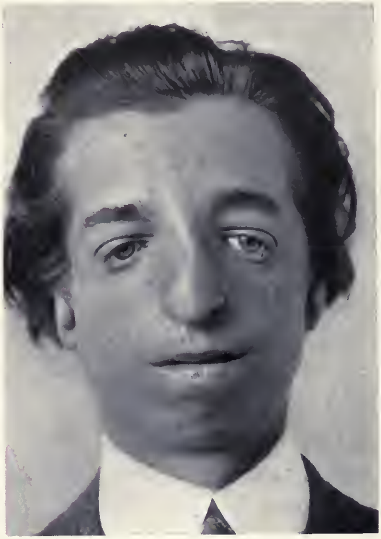

Fig. 449.—Front view of the patient as he appeared before treatment. Notice the broad, crooked nose, the slant of the eyes, and the two nodules for ears, which appear in this front view almost like normal ears in the picture, but which represent all there is present of an ear; the hair being carefully combed across, so as to hide the defect as much as possible.

This whole complex of deformities gave to this boy an extremely disagreeable appearance, and made this otherwise bright and very pleasant boy a nuisance in his home town. Besides all this, he had a septum which occluded the left nostril and allowed hardly any air to pass, and consequently his lacrymal duct on that side was obstructed and the seat of a chronic suppurative dacryocystitis (Figs. 449 and 450).

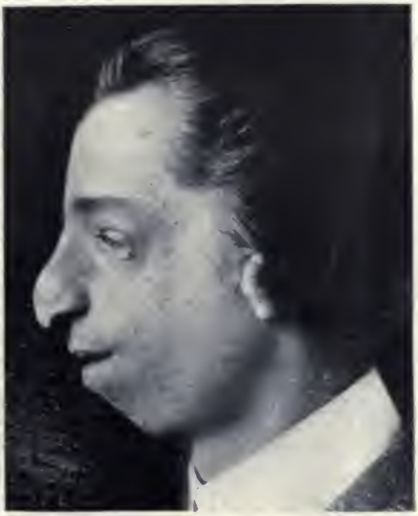

Fig. 450.—Side view showing the shape of the nose with its tip overhanging the upper lip, the projecting upper jaw, and the receding lower jaw. The defect of the malar bone in this case is visible, as there is a depression below the eye and the outer angle of the eye is everted slightly. The ear in this side view shows exactly the small lobule present, with a good shape of the same; something that the other side did not show.

It was rather difficult at first to form a plan as to the procedure of plastic operation, as there were so many problems involved in this complicated case. The following indications were present:

(1) An improvement in the appearance of the external nose (cosmetic).

(2) Removal of the obstruction of the nasal passages (functional).

(3) Cure of the dacryocystitis (functional).

(4) Plastic reconstruction of the malar portion if possible, so as to raise the external canthus of the eye (functional and cosmetic).

(5) Reconstruction of the meatus and formation of a canal if possible (functional).

(6) Reconstruction of both external ears (cosmetic).

The operative procedure decided upon was to begin with the nose, remove the obstacle to breathing by a submucous resection of the septum, and improve the shape of the nose by using the abundant tissue at the tip to make a new septum, thus diminishing the size of the nose at the same time, while the nostrils were freed and their openings directed toward the outside instead of downward toward the lips.

Under general anesthesia this operation was performed in the following manner: The septum was cut across in its soft parts transversely, about $\frac{1}{4}$ inch from its insertion into the upper lip, and then, with a pair of scissors, the inner cartilaginous septum was cut into such shape as the nose should have afterward. A triangular piece of cartilage was removed in this manner. The tip of the nose appeared now as an elongated strip of quite hard, resistant tissue, like the snout of an animal. A portion of it was removed at the tip and the balance folded over and fitted into a new septum, so that the nose was at once shortened and made more shapely (Fig. 451). This, however, was impossible without removing at the same time a portion of both wings of the nose at the anterior angle of the septum. Otherwise the nostrils would be transverse small slits. These portions of the nostrils were removed by cutting out two angular pieces, one on each side, and cartilage was removed to such an extent as to shape the wing of the nose properly. No raw surfaces were left, but everything was sutured into its place, and the nostrils both packed sufficiently to prevent an abnormal healing in the anterior corners of the nostrils. After a few days this packing and the stitches were removed.

An important point to be mentioned at this time is that the stitches should not be left too long in these reconstructive procedures, inasmuch as they easily cut through and produce scars which are unsightly if left too long.

At the same sitting, in the same operation, the right ear was attacked in the following manner: The little nodule of soft tissue on the right side, which was overlapping the place where the meatus ought to have been, and which contained a few irregular lumps of cartilage, was dissected

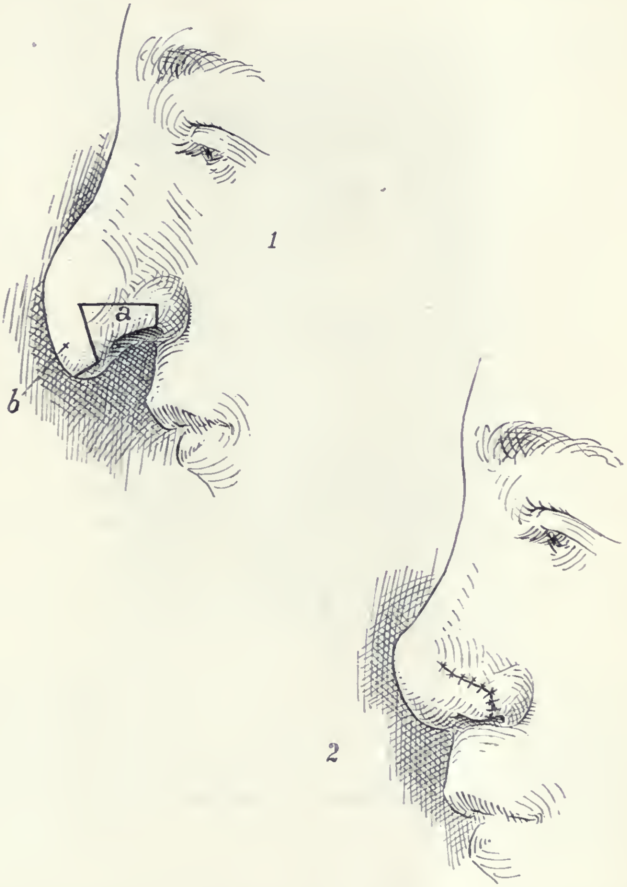

Fig. 451.—1. Incision and flap formation in tip and wings of the nose—*a* is the portion sacrificed, *b* the portion which formed the new tip. 2. Operation completed,

anteriorly from the site of the supposed meatus. By cutting this tissue in such manner as to unfold it and give it the shape of an ear, which, however, was very small, we obtained a defect about 2 inches in the longitudinal and about 1 inch in the horizontal direction. The border of the concha of the ear had not a very nice curved shape as a normal ear ought to have, but was rather too thick in its upper portion, and there was hardly any indication of a lobule. We looked in vain, by dissecting into the depth, for the remnant of an ear canal. At one time we thought we had a canal or a cavity lined with ciliated epithelium, but we soon found that it was the artificial product of our operation, and we had to conclude finally, after going deep enough, that there was no external auditory canal present.

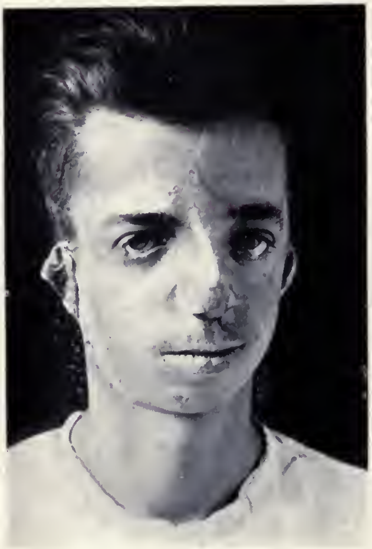

Fig. 452.—Appearance after the first operation, showing the results of the newly made septum, the removal of the point of the nose, and the implantation of fat in the malar region. It shows also the operation on the ear, the irregularly shaped new concha, and the rather succulent thick flap turned upward from the neck. The eyes appear in this figure much less slanting on account of the plastic, especially the left eye.

The all-important matter was now to give the ear the shape of an external concha, and not allow that lobule when it healed to again project forward. We knew it would have the tendency to do so, more especially since those few cartilaginous nodules were binding it tightly toward the face side and offered resistance to unfolding the ear backward into its new position. We therefore cut these cartilages in such manner as to arrange them in a half-moon into the border of the lobule and sutured the skin-cartilage-flap back to the region of the mastoid with a couple of skin-to-skin sutures, which we ordinarily use in order to retain the position of structures in plastic work. These sutures are placed through the intact skin, and have no other

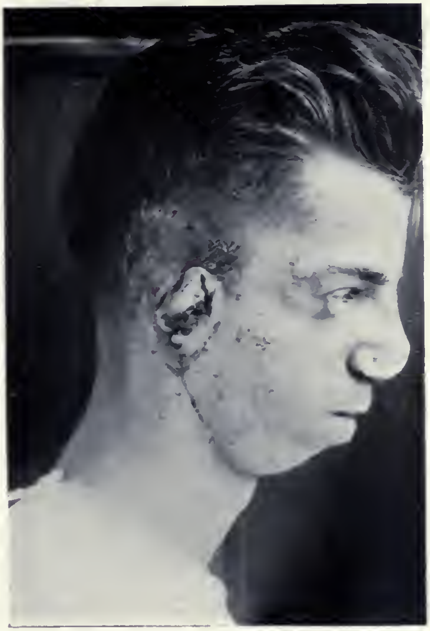

Fig. 453.—Side view which shows the shape of the nose—at this time greatly improved but still rather bulky on account of the swelling of the tissues forming the nostril. The ear shows already the shape of the concha, but some irregularity. One can see that the cartilage thus forming the base of the upper portion of the concha has this tendency to draw the ear forward again. The scar of the flap which forms the anterior portion and the future lobule is seen running alongside the chin.

purpose except to fasten portions of skin together in immobilization. This method I use frequently instead of any other immobilization, but the sutures must not be allowed to eat through.

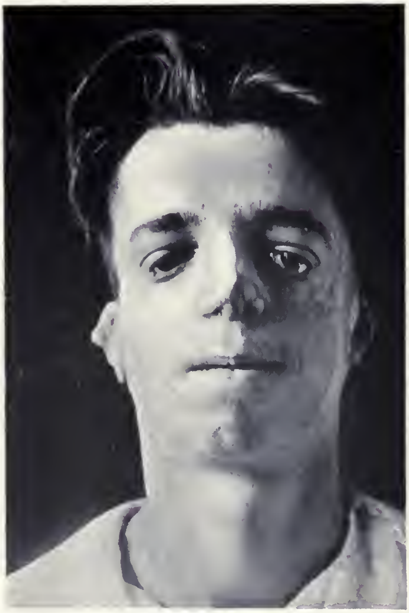

Fig. 454.—Several weeks after the ears are showing considerable size. They have both been operated on and re-operated, and the right ear already shows a lobule; but the shape of the ear is still not very natural, although the size is normal. The left ear is much better than the right one, having had a little more material to work on and having had a normal lobule. The outer border of the concha was here more arch shaped, and although the size of the whole external ear was smaller than it ought to be, its shape was more like the normal. A good deal of contraction has taken place in the nose, and one can see how pointed the tip is now, the swelling of the tip having given way to retraction. Notice also the retraction over the malar bone around the cartilaginous implants.

In this way we had a half-way decent looking ear, of small size, without any lobule, and without any depth, offering a defect of 2 by 1 inch. To cover this defect, and to obtain some material for a later lobule operation, we decided to use a flap from the skin of the neck to cover the anterior defect. A pedicled flap of approximately the same size, alongside of the jaw and below it, was cut out, left with its upper portion as a pedicle in contact with its matrix, and turned upward in the defect and sutured into the same, forming a broad anterior skin cover of the new ear (Figs. 453 and 454).

This completed the first operation. The patient recovered nicely from his operation, and a picture taken a short time afterward shows the remarkable improvement of his features. He was presented in this condition before the Chicago Surgical Society at one of its meetings.

From now on we had a large number of corrective operations on this patient; all of them were done under local anesthesia, which proved very satisfactory. To improve the shape of both ears, and to ultimately get a cosmetic result, since a perfect functional result is not possible on account of the absence of anatomic structures like the auditory canals, we had to go very slowly, and act only after having watched the result from step to step for some time. The results of these operations often looked fascinating and beautiful shortly after the operation; tissues were succulent and imitated the shape of organs just in the manner we wanted them to, but after a few weeks cicatricial contraction destroyed their shape and form, thinned them out, and we found that the result of our operative work had been greatly overrated. A successful terminal result requires, therefore, a great deal of patience and a good deal of ingenuity and also a good deal of experimenting, inasmuch as individual differences also play some rôle in these operations. What may be a good method in one case might not prove as good in another patient. As a rule it is better to take more tissue for plastic work than too little, because we find in the ultimate healing a great deal of shriveling up of transplanted tissues takes place.

The steps gradually taken in this case can be best described as follows: We very soon saw that the nose was contracted too much in the apex. The tip had become too sharp pointed at that place at which we cut off the septum (Fig. 455). We were, therefore, required to introduce some cartilages into the side of this apex, so as to make a broader tip to the nose. This was done by using cartilages from other patients, obtained from submucous resections, which is excellent material, cut into the required shape, and slipped under the skin by making a small incision near the point of the nose, tunneling under the skin, and slipping the cartilage into place and suturing with fine horsehair the opening through which it had been introduced. Two such pieces were introduced into the tip of the nose. The result was satisfactory at first, but we had to repeat this maneuver before we obtained the final result, as we cut the carti-

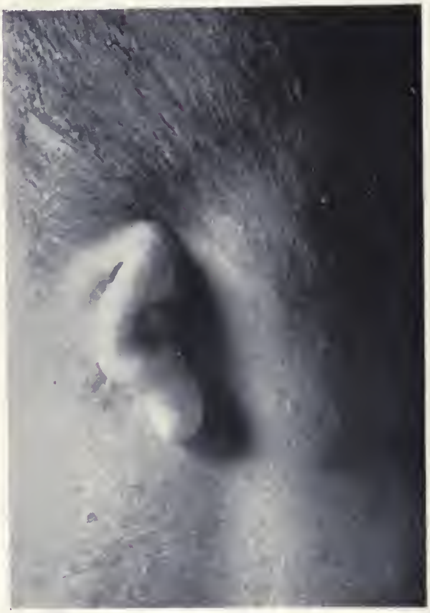

Fig. 455.—The ear in its original form. One would be inclined to think from this figure that there was a great deal of material present and that all that was needed was to dissect that ear from the front where it was, so to speak, adherent, deflect it outward, and one would have a normal ear. Only the lobule is normal, as one can see, and that very poorly shaped. The rest of the ear has a very small amount of tissue; the whole area, if deflected, not much larger than the lobule itself, but there is a sharply defined cartilage of a rudimental ear, which is more of a hardship than a help in the plastic, having a tendency to bring the ear constantly into this shape and making it difficult to roll it out.

lages too small at first, and found that between the implanted cartilages there remained depressions of the retracted skin.

A second procedure in the nose was necessary several times, through the constant tendency of the nostrils to diminish in size. If we kept them packed with gauze, or with especially devised dilators, we found that they were in excellent condition, but on leaving these dilators or packings off the nostrils gradually contracted, especially the left one, and ultimately we had to make a small correction under local anesthesia, sliding a small flap from the septum into the anterior corner of the nostril, so as to prevent the formation of a scar at this point.

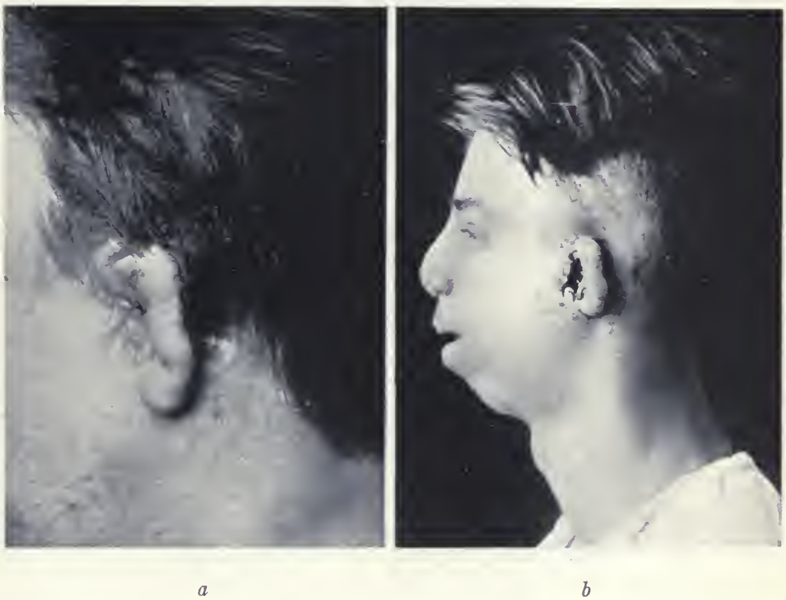
a *b*

Fig. 456.—These pictures show the left ear after it has been deflected from its original adhesion and before the ridge of new tissue is implanted. The meatus, however, and the depression of the ear has been formed by the plastic of a flap cut from behind the ear and drawn through the slit of the perforated concha. One can see the indication of the anterior fold of the concha formed from the skin in front. It needs in this case an outer flap on this defective ear, in the shape of a comb, as Fig. 457 shows during the operation.

The right ear was the greatest difficulty for us, because it had originally not the slightest resemblance to an ear. On the left side we had an easier task (Fig. 456). There was a very nice lobule present, which required no further correction, and it was only necessary to enlarge the ear by putting a crown upon the concha, which we gained by using a flap from behind the ear and inserting it on the top of the flap gained from the original defective ear (Fig. 456, *a* and *b*). This comblike attachment of the new flap meets beautifully the external outline of a normal ear. It has some hair growing on it, which is the only drawback, but otherwise it is perfectly satisfactory.

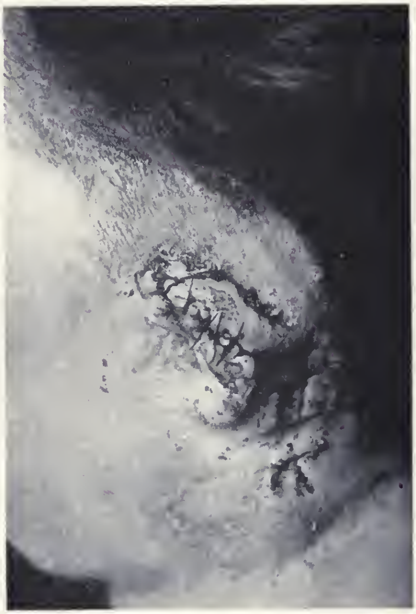

Fig. 457.—The condition after the flap has been formed, with the pedicle directed upward and its free end directed downward behind the ear. This flap, as one can see, is turned and fastened into the whole surface made by separation of the outer border of the rudimentary concha and sutured exactly in front and in the back. It is of considerable size, as it will shrink in course of time, and this must be taken into consideration. It is left in contact with its mother tissue until it adheres in its new position, and then the pedicle is cut and inserted exactly into its new location.

In order to give depth to the concha, which is the real beauty of an ear, we decided to use the method of the flap from behind the ear (Fig. 457) which we pulled through the substance of the ear by cutting a slit through the whole ear longitudinally and drawing the flap through the slit, attached to its former site by its pedicle. This maneuver made a beautiful depression in the center, which remained afterward when we cut the pedicle through and inserted it on the opposite side in the inside of the ear. By packing it with gauze or cotton daily we could keep it in its depression, and we could also force it to adhere slightly to the posterior surface of the ear, a maneuver which kept the whole ear in a normal position instead of giving it its tendency to flap forward like a dog's ear. This was best accomplished by using adhesive plaster without any other dressing over the ear.

The most difficult task remained to give the ear a certain amount of stiffness, which could be produced only by introducing cartilage into the same, since there was very little or none present. We gained this cartilage partly from the patient and partly from other people, using only small pieces at a time, being afraid that if we used a large piece we might have sloughing, and small pieces being introduced much easier through small incisions in different places and by tunneling into the desired place. In this manner we gradually introduced enough cartilage to build up a cartilaginous ear on the inside. The same process was followed also on the right side, where there was, however, more difficulty, because some cartilage was present there, which had a tendency always to push the ear into its former defective position. On the right side we had also a difficult task in forming a lobule, but ultimately it was possible, and was accomplished in a fairly good manner (Figs. 458 and 459).

There remained only one step for plastic, which was greatly desired by the patient; that is, the building up of his cheeks in the region of the malar bone, which was missing. We also introduced cartilage here on the left side, because the depression was more noticeable, and we introduced lumps of fat on top of it in the same manner, by making an incision at some distance, tunneling bluntly through the region where we wanted to implant, and introducing these transplants in the desired manner. The fat was taken from the buttocks and from the anterior thigh; the cartilage from other patients.

We could build up this region considerably, but there always remained a noticeable depression, inasmuch as the tissues in the course of months contracted to a considerable degree.

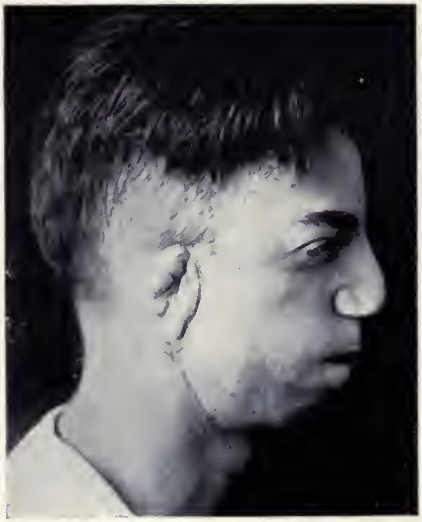

Fig. 458.—Appearance of the patient shortly before his discharge for home. On the right side the ear required several additional small operations in order to improve its shape. It is of normal size and the concha has a much more normal appearance. There is a tragus and antitragus; but little portions of cartilage will have to be inserted to make the ear more natural, which was done before the patient left. Also the lobule has been slightly improved. The nose is of very good appearance from this side; the right wing has a good shape.

When the patient left, after several months' treatment, we found him greatly improved in appearance, although it was impossible to make an ideal result in this very extensive case of abnormality. Some improvements are possible yet at a later period.

Most remarkable among the improvements, however, was that the hearing was better, and his speech improved considerably on account of the better hearing. In the beginning no one could understand the boy unless he paid very particular attention, and had him repeat a sentence two or three times, but at a later date even strangers could keep up a conversation with him. His mental improvement was the best of all. When he arrived he was shy and conscious of his looks and deformity, trying to evade the public eye and even the company of any one in the house. He began to get very chummy with other patients, played cards and games, and visited shows, and at last began to take great interest in aëronautics, expressing the wish to become an aviator, because he had read that defective hearing in a certain degree was favorable for people flying in the air, and he used to discuss these matters at some length with the physicians and nurses, showing that his mentality had also improved with the reconstruction of his face.

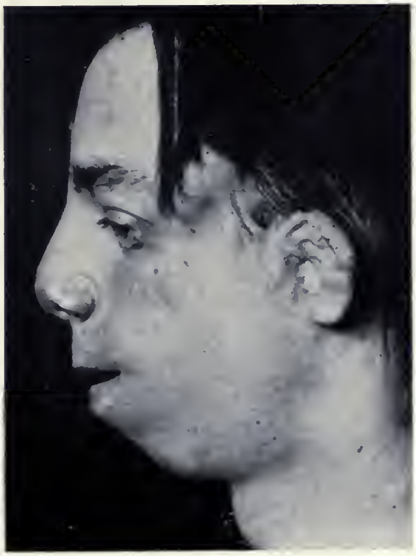

Fig. 459.—This view from the other side shows the condition of the left ear and the appearance of the nose from the left side of the face. One can see the nose almost of normal shape, the point built up by the introduction of several small cartilages, the eye raised, the malar portion also raised by the introduction of several portions of fat lobules and cartilage; the ear almost of normal shape and configuration. The white spot is cotton, which fills the new right meatus.

CLINIC OF DR. LEWIS L. McARTHUR

St. Luke's Hospital

FIBROMYOMA OF STOMACH SIMULATING STOMACH ULCER

Summary: Patient presenting characteristic history of stomach ulcer and repeated attacks of jaundice; severe gastric hemorrhage followed by epigastric pain; *x*-ray diagnosis; operation—pedunculated fibromyoma of stomach found and removed; after-history.

Of the 3 cases I am about to operate upon this morning, this one presents a most characteristic history of stomach ulcer. The patient has been under observation for some months preceding her entrance to the hospital on June 3, 1918. Her family physician concluded her to be suffering from chronic stomach ulcer, and tried the usual remedial agents. Her family and past history are negative. She had never been seriously sick until the onset of the present trouble, which is, on the whole, of two years' duration. During the past two years she has complained of headache, nausea, and vomiting, which are often preceded by a chill. She has been constipated and has had repeated attacks of a mild jaundice. For the past three months she has lacked appetite and had no desire for food. She has not had eructations of gas. During the past two weeks in the hospital she has had epigastric pain, coming on after meals and lasting from one-half to two hours; she was, in fact, brought to the hospital during a severe hemorrhage, in which she bled to exhaustion and exsanguination. For three days preceding the hemorrhage she had been nauseated. She has frequently passed black, tarry stools, and for these three days had passed large, copious ones of this type. The vomiting of blood had not been noticed prior to this time of admission.

The hemorrhage being checked, a blood examination, made seven days after this hemorrhage, showed reds, 4,260,000; leukocytes, 7000; hemoglobin, 54 per cent.

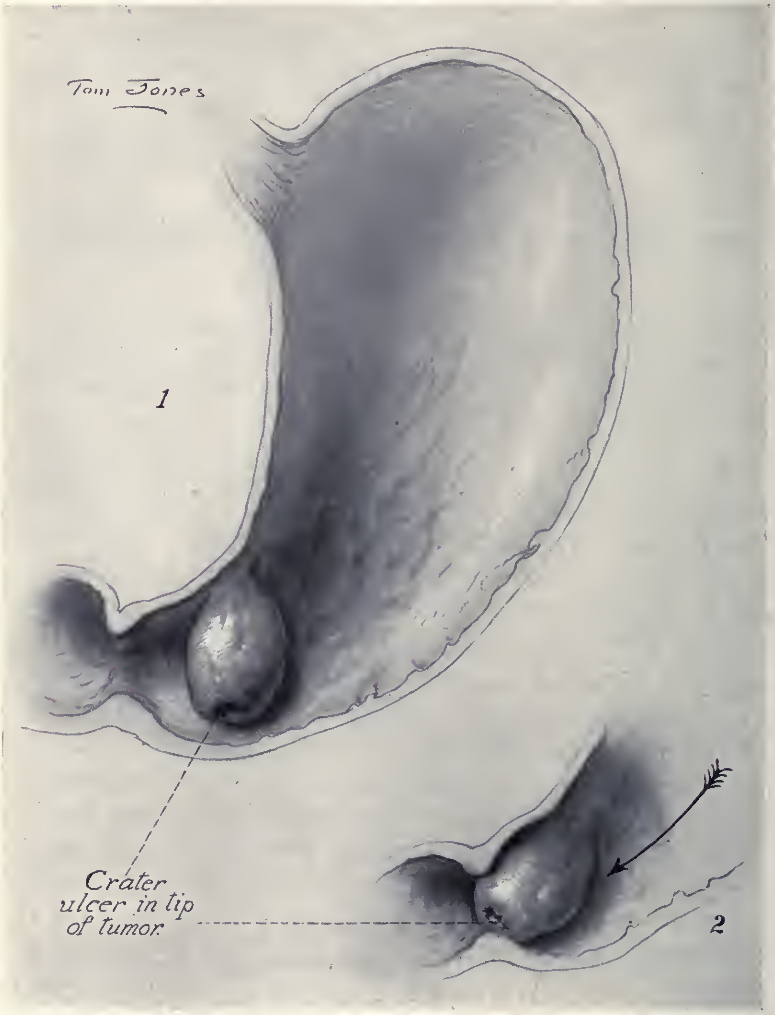

Fig. 460.—Pedunculated fibromyoma of stomach with crater ulcer of its apex, producing typical clinical symptoms of bleeding pyloric ulcer with stenosis.

Three months prior to admission x-ray investigation was made of the stomach, and it was shown to be practically normal in size. The pylorus did not fill out well. The bulb was perfectly normal. Peristaltic action was increased. The emptying time, however, was very much prolonged, one-half of the bismuth meal being present at the end of eight hours. The colon showed no abnormality. The radiographer returned the diagnosis of an ulcer, with prolonged retention of the gastric contents.

We have then here a case as positively characteristic of pyloric ulcer as one can hope to find. The vomiting of blood and the passage of tarry stools confirms the lesion, and the hemorrhage having been so severe as to jeopardize life operative interference rather than medication is imperative.

Operation.—June 7, 1918. Because of her anemic condition we shall use a gas-oxygen anesthesia. I have made the usual midline incision, and, because of the reported frequent though painless jaundice attacks, will first examine the gall-bladder and bile tracts. The gall-bladder appears normal in every respect. Nothing is to be palpated in the common duct, the cystic duct, nor is there induration of the head of the pancreas. The pylorus and duodenum are both normal! No evidence of cicatrices visible.

With so frank a history of ulcer, and the conviction so strong of its existence, I shall make a more careful search along the lesser curvature and posterior wall of the stomach. In making this search I believe I have found the cause of her trouble. I have found a movable mass, the size of a large English walnut, just proximal to the pylorus, and apparently attached to the posterior wall of the stomach, near the lesser curvature. I am chagrined at the error in diagnosis, but will apply stomach clamps to the stomach on either side of the tumor, clamping them sufficiently tight to control hemorrhage and escape of contents. Between them I shall make an incision through the anterior wall of the stomach in order to expose the pedunculated tumor. On doing this it is possible to make the tumor appear through the anterior incision, and, grossly, it gives the appearance of a pedunculated

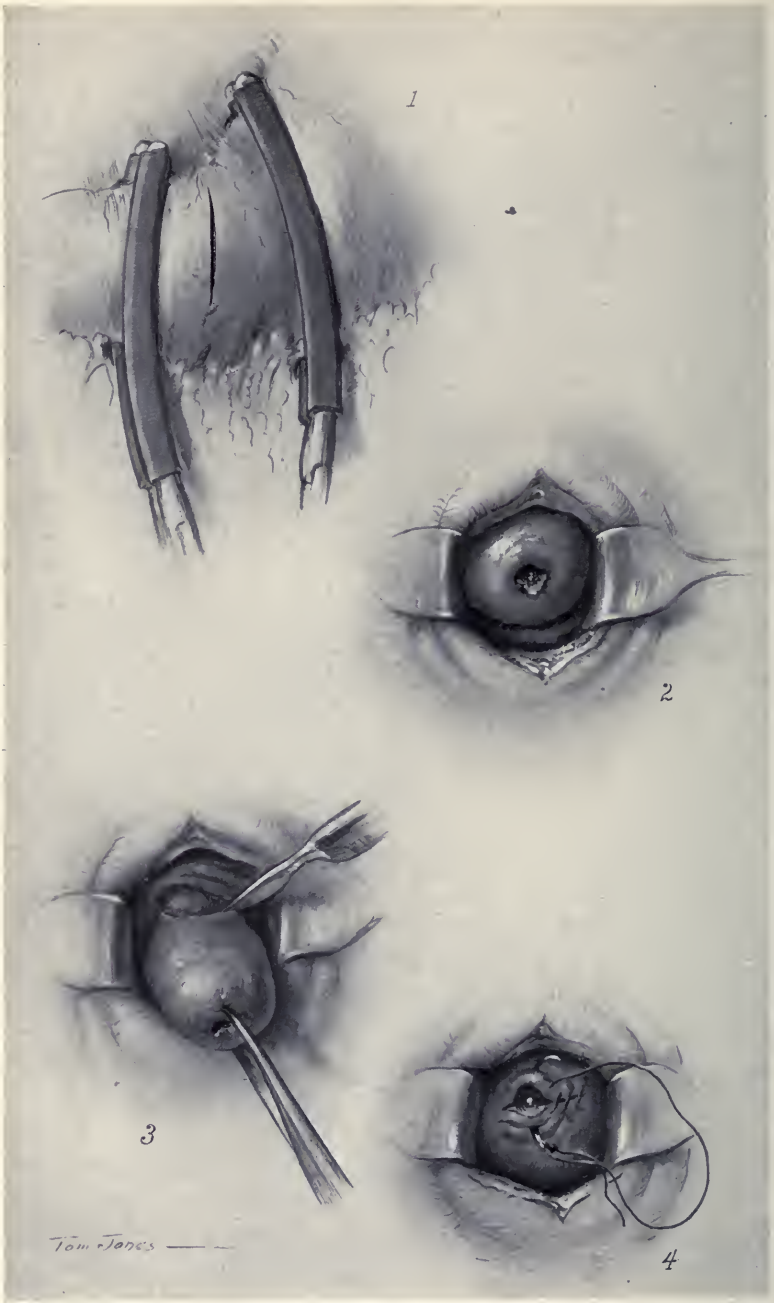

Fig. 461.

fibroid covered with mucous membrane, but, strangely enough, showing an ulcer of crater character on its free end.

In order to remove this growth I shall make a cuff of mucous membrane near its attachment to the posterior wall of the stomach, and if necessary resect the muscular wall there also; in fact, this cuff of mucous membrane, stripped back from the tumor, enables us to enucleate the tumor completely without further disturbance of the posterior wall than the incision in its mucous membrane. This we close with a simple, continuous catgut. The closure of the anterior wound is made in the usual manner, but it is of no special interest. But of intense interest is the fact that in this case a pedunculated tumor so situated

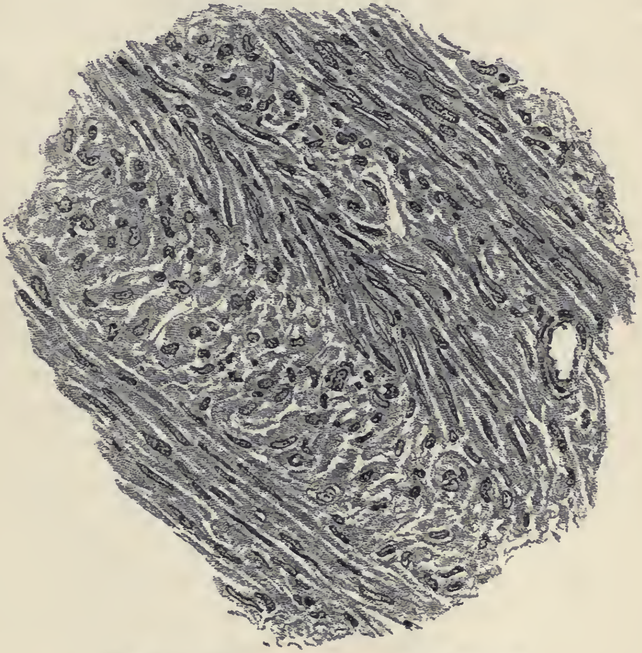

Fig. 462.—Microscopic section of fibromyoma.

Fig. 461.—Illustrating steps in removal of tumor: 1. Incision in anterior stomach wall between clamps. 2. Delivery of tumor through incision. 3. Flaps of mucosa reflected from pedicle, and discovery that posterior wall is not involved in growth. 4. Closure of posterior wall mucosa.

in relation to the pylorus that with the peristaltic waves it completely occludes the same like an obdurator, and provokes both pain, nausea, and retention without observable deformity. The ulcer situated on its free apex may be so constricted by the pylorus muscle as to make a prolonged hemorrhage, thus explaining the tarry stools, the great faintness, and probably explaining the jaundice rather as a urobilin jaundice (from the decomposition of blood in the intestines) than a bile jaundice incident to common duct obstruction.

Further History.—Patient made an uneventful recovery. Stitches removed on the tenth day; up and about on the twelfth day; left hospital on the thirteenth day after operation, and now reports herself free from digestive disturbances.

Microscopic examination of the tumor reveals it to be a fibromyoma. Examination of the ulcerated area reveals no carcinomatous degeneration of the ulcer surface.

My colleague, Dr. Arthur Dean Bevan, has had a similar case, in so far as the tumor and location of ulcer is concerned, but in his case the tumor was carcinomatous.

CLINIC OF DR. CHARLES MORGAN McKENNA

St. Joseph's Hospital

PRESENTATION OF THREE GENITO-URINARY CASES

Summary: Case I.—Demonstration of a case of ureteral calculus previously operated.

Case II.—Varicocele—method of operation—after-care.

Case III.—Stone in bladder complicated by a colon bacillus infection; history of case; technic of removal—advantages of a suprapubic cystotomy over a stone-crushing operation; treatment of bladder infections; closure of wound—necessity for careful closure in bladder operations.

CASE I.—URETERAL STONE—SUBSEQUENT HISTORY

Some weeks ago we operated in this clinic a man with a stone in the lower portion of the ureter.[1] I think some of you will remember this case. It was a very large conical-shaped stone, the removal of which was followed by the discharge of a considerable amount of pus. I think there was some argument among the students that morning regarding the question of the kidney on the corresponding side, as to whether it would functionate or not. I have brought that patient in this morning to demonstrate the case to you with the cystoscope and to let you see that urine is coming from that side.

We will now fill the bladder. You notice that the bladder contains the normal amount of fluid. On examining the ureter on that side you will see that urine is coming from it. The bladder shows the scar where the incision was made. The urine is coming naturally. I might mention here that I have already done a functional test on this man and found the kidney function normal. The patient also reports that this is the first time in his life, or at least in the last eighteen years, that he has been entirely free from pain. It just shows you how a patient will

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[1] This case was reported in the Surgical Clinics of Chicago, October, 1918.

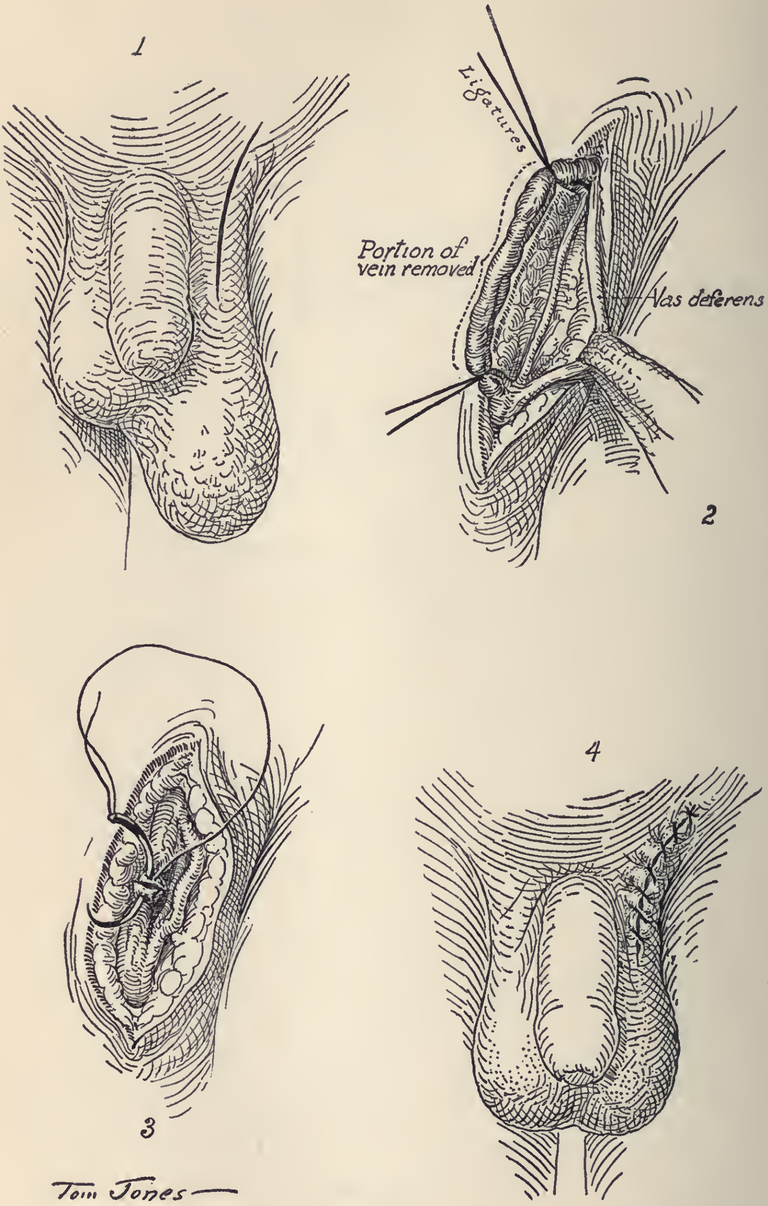
1
Ligatures
Portion of vein removed
Vas deferens
2
3
4
Tom Jones

Fig. 463.

continue to go from day to day with an impacted foreign body and yet persevere with it. I can only say that it is as much satisfaction to me, I believe, as it is to the patient to have him entirely well. I would like to have each man look in the bladder and compare the condition with that found on the morning we did the operation.

CASE II.—VARICOCELE OPERATION

This young man is twenty-seven years of age. He has been suffering for some time with a varicocele on the left side, which is the usual location. As he has decided to go into military service, and wants to report as soon as possible, he has asked me to do this operation so that he may be out of here in a very short time.

I believe that the best way to get a perfect result and cause the patient as little inconvenience as possible is to make the incision at the junction of the scrotum to the body. We cut down, you notice, to the cord (Fig. 463, 1). There is very little bleeding. We pick up the cord, and immediately separate the vas from the rest of the contents of the cord (Fig. 463, 2). This is done, as you see, in a very simple manner, by rolling the cord over the fingers. We find the vas very hard, and it feels very much like a large piano wire. I will just pick it up and show it to you. You see it tallies very well with the description given in most text-books. It is white in appearance and very firm in consistency. We will put this over to one side by putting a sponge around it. I now pick up the vein. You notice that we do not go down into the scrotum and try to ligate a portion of the pampiniform plexus, but will just take out a section above. You can also notice that the testis on this side hangs very much lower than it does on the other side, and that

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Fig. 463.—1. The line of incision. 2. The vas deferens is being held aside by means of a strip of gauze after having been isolated from the cord. The vein has been ligated above and below. 3. The vas deferens and artery have been returned to their normal location. The ligated ends of the vein are being sutured together. Note that this shortens the cord approximately 2 inches, thus raising the lowered testicle on that side. 4. Incision closed. Note normal appearance of scrotum.

it is very much smaller on this side. By taking out a section of the vein, as we are doing here, and bringing the lower portion up, we not only cure the man of the varicocele, but we also do a suspension of the testis on that side (Fig. 463, 3). It is interesting to know that this class of cases is relieved greatly after operation, and many times where the patient is young the testis on that side will regain its normal size. This, of course, is due to nourishment alone. I believe this operation should be advocated where this condition exists. This man will suffer scarcely any pain afterward.

We will close the wound by putting two catgut sutures through the covering of the cord and close the skin with interrupted horsehair sutures (Fig. 463, 4). I am using horsehair this year exclusively, as it is almost impossible to get silkworm-gut.

It is most important that the after-care in this class of cases be followed out carefully. You notice we place on this patient a very tightly fitting T-binder to hold the testis in the proper position. Immediately after this operation the collateral circulation is establishing itself, and much damage can be done if the testis is allowed to hang without support. It will also cause a great deal of edema and swelling, and as a result your patient will have a considerable amount of pain for the first few days after the operation, necessitating his remaining in the hospital for some time. I have seen cases of this kind in which a support was not used followed by infection, which caused the patient's stay in the hospital to last from five to seven weeks. If we can only keep in mind that the little things in the after-treatment will do more than a few of the big things that we speak so much about, I believe it would be better for the patient, hospital, and ourselves.

CASE III.—STONE IN BLADDER COMPLICATED BY A COLON BACILLUS INFECTION

Mr. C., thirty-two years of age, was referred to me by Dr. A. A. Hayden. This man gives a history of a Neisserian infection about four years ago, and he believes that his entire trouble dates from that time. He complains of a great deal of pain in the bladder region and excruciating pain during urination. He has very frequent urinations, getting up as often as six to eight times at night. He says that many nights before he can go to sleep it is necessary for him to stand practically on his head, with the feet and legs up beside the wall. By so doing the pain is relieved. He gives a history of having passed a stone with some blood. That in itself would be sufficient evidence on which to base a diagnosis.

This patient has been cystoscoped, and a very much inflamed bladder containing a great deal of pus was found. A mass can be seen, which we believe is a stone. After the cystoscopic examination we passed a stone-searcher and could easily feel the stone. You know it is possible to overlook stones in the bladder, especially in this type of case, where there is so much blood and pus present that the media is almost red, which makes the view nearly impossible. We spent some time irrigating this man's bladder before attempting the cystoscopy. I might say that we irrigated the bladder as many as twelve to fifteen times before anything like clear fluid was returned. We made cultures of the pus, and found that it was nearly a pure colon bacillus infection. He also complains of some pain over the left kidney, which, of course, may be the result of a colon infection on that side. We did not attempt to catheterize the ureters at this time, as his primary trouble is a stone with infection, and I believe after removal of the stone and proper irrigation through the suprapubic opening the infection will be relieved.

This patient, you observe, has been prepared in the usual manner, just as for a suprapubic prostatectomy or any suprapubic opening into the bladder. We will do this operation under local anesthesia, using $\frac{1}{2}$ per cent. novocain. You notice that we do a nerve-blocking operation. First we use a very fine hypodermic needle attached to a very large syringe. After a few superficial injections we change to a larger needle, which is about 3 inches long. After the needle is pushed through the skin, it is very easy to anesthetize the different tissues from the same position without traumatizing the skin or causing any extra pain to the patient. Sometimes I think we do not give the patient enough consideration even with a local anesthetic. The patient, you must remember, is under the greatest tension, and is really waiting to be hurt. You notice that I can take the edge of the knife or the needle and carry it in this way, and the patient has not the slightest sensation of pain.

Before filling the bladder I inject 4 drams of a 1 per cent. cocain solution into the bladder to relieve the patient of any pain from the instillation of fluid. By so doing we are able to distend the bladder so that it will present itself well in the suprapubic space. Now we will fill the bladder. It holds about 1 pint.

We are making a median incision, cutting down through Retzius' space and exposing the bladder. You notice that I am making a very small incision. It is not necessary to make a large incision for the removal of stones. We only want an incision large enough to remove the stone and introduce a drain. We must keep in mind the peritoneum, which is so closely associated with the bladder. You notice I am stripping back the peritoneum with a sponge, and pushing off the fat from the outside of the bladder. I have always made a special point of getting the fat well off the bladder, thus preventing necrosis around the bladder afterward. I remember the time when we paid scarcely any attention to this part of the technic, and as a result had a great deal of fat necrosis and many sloughing wounds.

The bladder is now well exposed, and is apparently very thick. I will introduce a couple of guy-rope sutures on each side of where I am going to make the incision, so as to hold the bladder in place, as we may experience some difficulty in reaching the stone. The patient will not stand very much pressure on the inside of the bladder because of the terrific cystitis which is present. You notice that the catheter, which we inserted into the urethra for the purpose of filling the bladder, is still in place. We release the end of the catheter, and let the fluid run out through the urethra instead of allowing the infected water to run out through the entire wound over the abdomen. You see as long as I have the peritoneum stripped back, and the bladder presenting itself well in the wound, there is no danger of injuring the peritoneal cavity. I will now make a small incision into the bladder about 1½ inches long, as I believe the stone is fairly good sized. I can feel the stone with the end of my finger, and would say that it is about 1¼ inches in diameter. I am not going to spend much time in trying to remove it with my finger, but will apply a stone forceps. You notice this forceps is mounted in rubber, and will cause little if any damage to the mucosa of the bladder. I have a good firm hold of the stone, and will deliver it through the opening, which I believe is large enough for this purpose. It is with some difficulty that I extract the stone through this opening, but with a little care it can be done without elongating the incision. Every time you elongate an incision the danger of infection is greater and the length of time required for wound healing is prolonged. This stone is conically shaped and eroded. The conical-shaped portion has been fitted into the prostatic urethra, and that portion of the bladder has a large ulcer where the stone rested most of the time. You can easily understand why it was that this patient took the peculiar position in bed that he did, because by standing on his head the stone was thrown into the fundus by the bladder, thus relieving him of the pain produced when the stone rested on this very sensitive bladder ulcer. I will now put my finger in the bladder to be sure there are no other stones present. The bladder is perfectly free from the stone.

We will now place a ½-inch rubber drain in the bladder. I usually use a smaller drain in stone cases, but this man is suffering from a severe colon bacillus infection in addition to the stone, and better drainage is required. You who are familiar with infections in the genito-urinary tract know that a colon bacillus infection is very difficult to control, and, therefore, it is very necessary to establish good drainage so that we may give the patient bladder irrigations every day.

I have previously said in this clinic that I rarely ever irrigate the bladder after prostatectomy or after scarcely any bladder cases, but where this sort of infection exists it is necessary to establish good drainage in order that we may have perfect irrigation. Some one has just asked what we use for irrigations. A great deal has been written regarding the best irrigating fluid for colon bacillus infection in the bladder. Personally I have had better results from the use of silver nitrate, which I have used in irrigating solution in the strength of 1 : 5000 down to 1 : 1000, often using deep injections of 1 to 2 per cent. silver nitrate. Of course the strength of the nitrate solution should be increased gradually. I have even used argyrol, 20 per cent., increasing the strength as the patient was better able to tolerate the pain. At first we irrigate the bladder every day, then every other day, and so on until the infection is practically cleared up. The patient is then cystoscoped, and if the colon infection still persists a ureteral catheterization will be done to ascertain which kidney is producing the infection. If the kidney is producing the infection it would be useless to continue the bladder irrigations, as the kidney is simply emptying the pus into the bladder, thus continuing the trouble. In these cases we then introduce a ureteral catheter, through which we inject from $\frac{1}{4}$ to $1\frac{1}{2}$ per cent. silver nitrate solution. This is repeated as often as necessary until the infection subsides. The silver nitrate solution not only has an antiseptic effect, but it irrigates the kidney, thus producing thorough drainage.

Some one has just asked me why we did not do a stone-crushing operation in this case. In fact, I think the entire class is wondering why we have not done this kind of an operation. The reason is because of the pathologic condition of the mucosa of the bladder. In the first place, a stone-crushing operation is only possible where you have a clean smooth mucosa. But suppose we did put a lithotrite in this bladder and try to crush the stone and then use a long aspirator afterward. In all probability there would be particles of stone left in the bladder, which would adhere to the side of the broken-down mucosa and would only serve as a nucleus for another stone or stones, and the patient would be worse off than before the operation. In cases where the mucosa is badly broken down or infection is still present it is not good surgery to try to introduce a lithotrite and attempt to crush the stone. In these cases one should always do a suprapubic cystotomy.

You notice now we are closing the wound all the way up to the tube. The tube is at the upper angle of the wound. Each layer has been sutured close to the tube, so when we see this case in a few days there will be primary union in the lower portion of the wound up to the rubber tube. In other words, we have made a water-tight wound up to the tube. This is very essential for the patient. He should suffer no more from this operation than from a clean-cut appendicitis wound. I have paid a great deal of attention to the closing of bladder incisions, knowing the amount of trouble that can take place afterward, and the terrific amount of inconvenience that a patient has who has foul-smelling urine running over the abdomen, from the continual changing of dressings, and the wet condition of the bed.

It will give me great pleasure to have this entire class inspect this patient at a later date and see the clean wound.

In conclusion I wish to say that removal of the stone alone would not cure this patient. The colon bacillus infection must be treated after operation, and I believe it will take some time to clear it up.

CLINIC OF DR. MAURICE A. BERNSTEIN

Wesley Memorial Hospital

THE TREATMENT OF EARLY AND LATE INFECTIONS OF THE HAND AND FINGERS, WITH SPECIAL REFERENCE TO TENDON TRANSPLANTATIONS

Summary: Discussion of infections of the hand and fingers—routes of extension; value of early incision and drainage; incisions to be employed; presentation of 4 cases illustrating the different types of finger infection.

Case I.—Acute infection of little finger—improper treatment at onset; necessity of wide incision and thorough drainage.

Case II.—Acute infection of index-finger—infection limited to superficial structures.

Case III.—Destruction of tendons as a result of infection of the ring-finger—tendon transplantation; history; technic of operation.

Case IV.—Ankylosis of index-finger; history; technic of operation; subsequent course.

September 26, 1918.

Infections of the hand, especially of the fingers, are of common occurrence as the result of industrial accidents.

Today I propose to show you a few typical cases of this kind, but before doing so I wish to say a few words regarding the nature of the lesions usually met with.

Clinically, these cases of infection may reach the surgeon either in the early or acute stage, or later when the infection has subsided, leaving its effects in the shape of deformity. We will first consider the acute infections.

An acute infection may be superficial, involving the superficial tissues only, or it may be profound, involving the tendons and their sheaths. Infection involving the superficial subcutaneous tissues can usually be arrested.

If a tendon sheath is infected, the patient usually complains of pain along the inner surface of the finger and holds it in a flexed position. When the surgeon attempts to extend the finger the patient will cry out with pain. This is because of tension produced upon the inflamed tendon sheath. When an incision is made into the sheath and pus escapes, there is no question about its being infected. The limiting membrane which is found in tendon sheaths will not prevent the spread of infection. Fluids injected under moderate pressure will find their way into the deeper structures. Therefore, every tendon sheath infection should be opened and drained early.

There are three ways in which an infection of the finger may be propagated: First, by way of the lymphatics; second, by way of the subcutaneous tissue; third, by way of the tendon sheaths. The lymphatic infections are usually of streptococcic origin. They are acute in onset, usually the result of an insignificant pin-prick or cut, and are associated with marked constitutional symptoms, fever, and glandular enlargement. Such lymphatic infections when they extend are usually very severe in type, and loss of the patient's life is more to be feared than loss of function or even loss of the member. When a lymphatic infection is suspected the supervision must be extremely careful, and surgical treatment when necessary must be radical. I shall not at present refer to these infections.

Of the superficial infections involving the finger the felon, which is found on the distal phalanx, is the most common. The diagram which I show is from Kanavel's book, and it illustrates the pathology very accurately. It can be seen in this diagram (Fig. 464) that the connective-tissue framework of the terminal phalanx is such as to produce a closed sac. The glands lie in the columns of fat and present a portal for the entrance of pathogenic bacteria. The blood-vessels run parallel with the phalanx on both sides of the sac. Should pus or edema develop in the closed sac it would have no means of escape, and would have a tendency to shut off the blood-supply and cause necrosis of the bone. One can often see the bone of the terminal phalanx lying free in this mass of necrosed tissue.

The incision for drainage of a felon must be made to the side of the phalanx and wide enough to permit the escape of pus. By cutting on the side of the phalanx the tactile nerves will not be injured.

We now come to the third avenue of infection—namely, the tendon sheaths—and it is to this class of finger infections and their surgical treatment that I wish to draw particular attention. Before undertaking the treatment of infections of the tendon sheaths one must familiarize himself with the general topography of the hand. Four spaces are to be considered, namely, the radial, thenar and midpalmar space, and the ulnar bursa, because infection of the tendon sheaths will involve one or more of these spaces. The index- and little finger differ from the other fingers in that the infection from the index-finger may extend to either or all of the following: First, the lumbrical space on either side; second, the thenar space and dorsum of the hand between the metacarpal bones of the thumb and index-

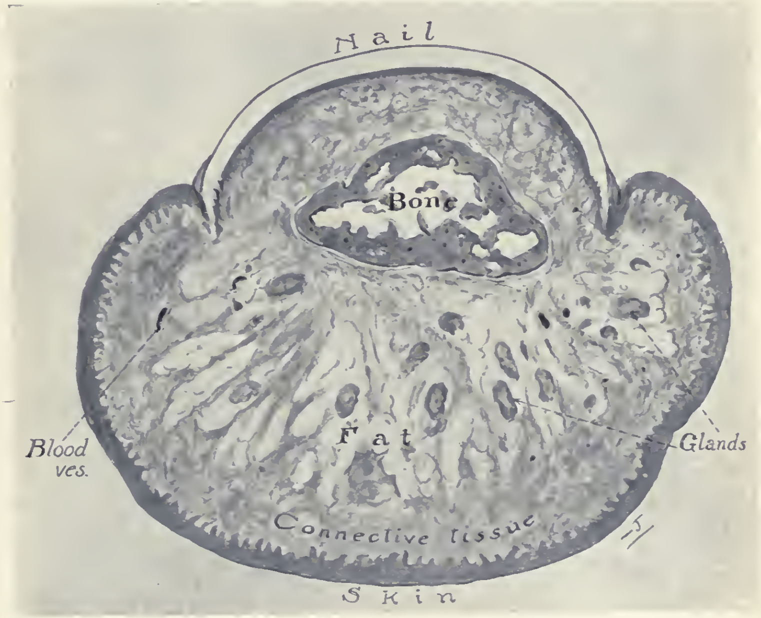

Fig. 464.—Transverse section of the distal phalanx, showing the closed pocket with columns of fat radiating from the bone. The glands are well shown, and demonstrate how easy it would be for pathogenic organisms to invade this space through these glands (Kanavel).

finger. The infection will not often extend to the distal interphalangeal joint. By referring to the diagram (Fig. 465, right-hand drawing) the tendon sheath of the little finger will be seen communicating with the ulnar bursa, while the left-

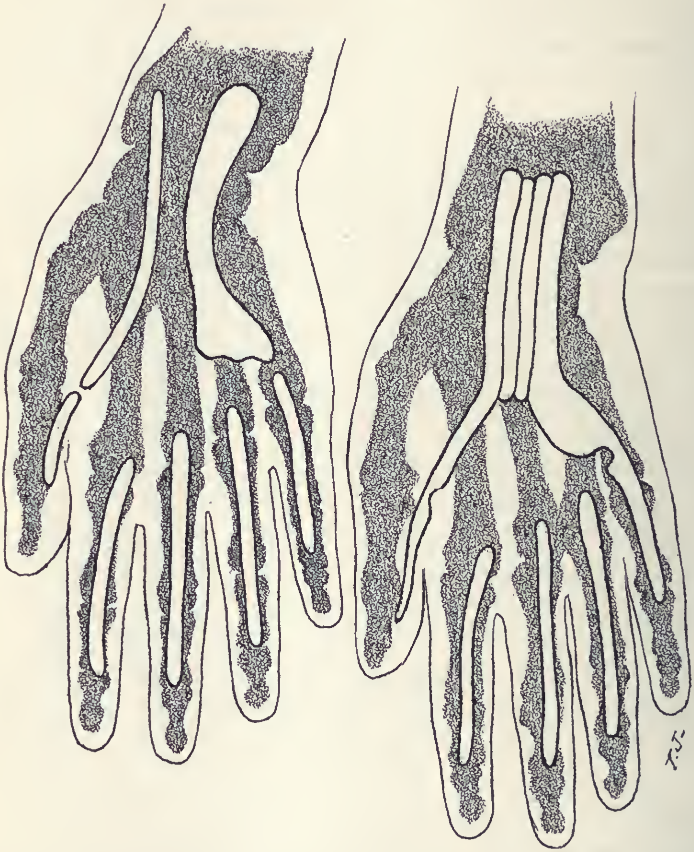

Fig. 465.—Drawing from x-ray picture upon which are shown two types seen in the flexor tendon sheaths. Note that in the hand upon the left side there is a continuation between the little finger and the thumb and the ulnar bursa and radial bursa respectively. Note also the connecting sheath between. In the hand upon the right side the sheaths are separated not alone from their respective fingers, but from each other. The type noted upon the left side of the picture is present in almost all cases the author has seen, and surgery based upon this symptom will be the wiser course (Kanavel).

hand drawing shows the tendon not in communication with this bursa. In this latter case the pus may find its way to the midpalmar space unless it burrows its way through the obstacle between it and the ulnar bursa. In extensive infections the radial bursa may also be involved. Infections of the little finger, therefore, usually extend into the ulnar bursa, with possible extension to the radial bursa, or maybe into the midpalmar space.

Tendon sheath infections from the middle and ring-fingers usually involve the midpalmar space only.

Before opening a tendon sheath for the drainage of pus it is necessary to make sure that the infection is not localized to the superficial tissues. By pressing on the base of the finger or palmar surface of the hand it can be determined whether the lumbrical canal or tendon sheath have become involved. This is determined by the egress of pus from those spaces. A probe is introduced along the infected area, without trauma, and an incision is made upon the probe down to the deep structures.

To drain the thenar space a forceps can be introduced through an incision which is made about ½ inch below the web to the radial side of the index-finger. The forceps is directed inwardly to the third metacarpal bone and then the blades are opened. The pus will find its way to the surface. Considerable care must be exercised in the introduction of the forceps into the thenar space, so that injury to the midpalmar space will be avoided. If it is determined that the infection has extended to the dorsum, which it usually does, a through-and-through drain should be inserted. An incision on the dorsal surface of the hand must be made between the metacarpal bones of the index-finger and thumb, and a drain carried through this opening.

For drainage of the midpalmar space an incision is made a little to the side of the ring- and middle finger. A probe introduced along the canal will find its way to the midpalmar space, and will also drain the lumbrical canal if the infection has extended in that direction.

When the radial bursa is involved the incisions are extensive.

They are made on both the radial and ulnar side of the forearm (Fig. 466). A forceps should be inserted through one opening, and carried beneath all the tendons in the forearm and brought out through the opposite opening. A through-and-through drain is inserted and hot dressings applied. The technic which I have followed in the treatment of these acute infections is based on the teachings of Allen B. Kanavel. One must study a cross-section of the hand in his text to understand the relation of the communicating chambers. There is no question that 90 per cent. of the hands could be saved if judgment and care were used in their treatment.

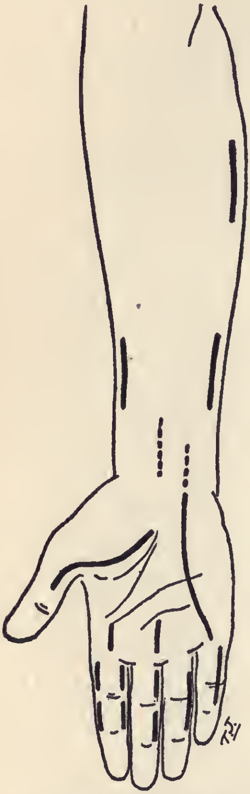

Fig. 466.—Lines show area of possible incisions for infections of the various tendon sheaths. In case of doubt the free incision of the whole sheath is to be advised (Kanavel).

We now come to the late effects of finger infections and to the deformities resulting from such infections. There are many such chronic cases, and the problem of efficacious surgical treatment constantly arises. Where subluxation of the joint with ankylosis has occurred we can promise very little. Many operations have been devised for restoration of the joint, but in my opinion once a finger-joint *has become ankylosed* there is little hope of getting complete motion. The action of the finger is specialized and adapts itself to various degrees of motion. In those cases where ankylosis has taken place the synovial membrane becomes thickened, the articular surface becomes roughened, and the flexor tendons become involved on account of the proximity to the bone. What happens, therefore, is this: Dense fibrous adhesions form between the articular surface and the synovial membrane of the tendon sheath, resulting in ankylosis.

In case of established ankylosis one must plan a two-stage operation: first, to restore the joint; and, second, to establish motion by tendon plastics. Porter maintains that if only one articular surface is removed a false joint can be established, and motion in the joint can be restored to a certain degree. The finger, however, becomes much shortened. The interposition of fascia between the articular surfaces will in a measure prevent the recurrence of the ankylosis, and motion must be established as soon as the patient can bear the pain. This procedure will be followed in one of our cases.

Much can be done during the acute stage of the infection to prevent such distorting and destructive processes. Very recent reports of war surgery indicate that ankylosis may be avoided and complete functional movements obtained in infected joint injuries if such are immediately cleansed, sutured, and active movements at once instituted. But such treatment has not yet been generally adopted. In our present general practice a finger with an acute infection of the tendon and tendon sheath must be maintained in absolute rest, elevated, and kept in an extended position. The finger which is ankylosed in a straight position stands a better chance than one which is ankylosed in flexion, because, first, those fingers have no subluxation of the joint surface; second, because there is no flexion-contracture of the soft parts. In cases of this sort very satisfactory results can be obtained from tendon transplantations, and especially by transplanting the tendon *with its sheath*. The skin conditions must, however, be corrected before making a transplantation, and there must be the further precautions not to transplant a tendon into tissues which are fibrous, thin, or avascular. The circulation in the tissues surrounding the transplant must be sufficient to maintain the nutrition of the implanted tendon. This operation will be done on some of our cases and its detailed technic explained.

CASE I.—**Acute Infection of Little Finger.**—This patient is a factory hand. Several days ago he injured the little finger of the left hand. There was a slight bruising of the skin on the flexor surface of the finger close to the proximal crease. On the third day after the injury the finger became tender and swollen, the swelling extending to the ulnar side of the hand. An incision was made by the factory physician into the flexor surface of the finger and another on the extensor side. A through-and-through drain was inserted and hot applications applied. The swelling of the hand continued, and pus in small quantity appeared on the dressings.

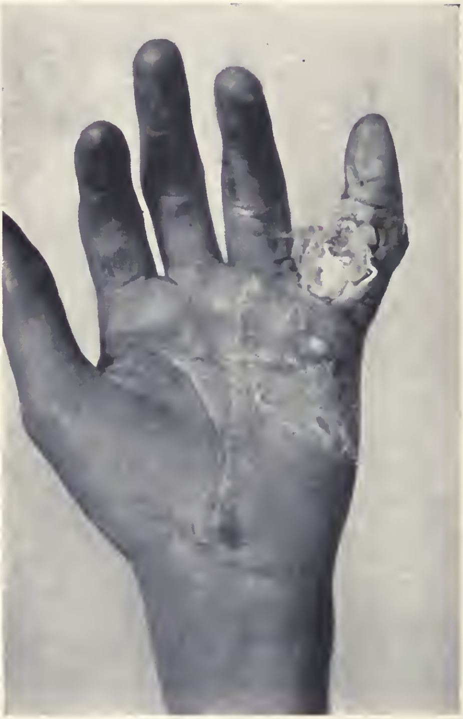

Fig. 467.—Infection of the tendon sheath of the little finger, showing necrosis of the tendon, which appears white in the photograph, and the edges of the wound everted.

Examination.—The finger is quite swollen and tender, the tenderness extending to the ulnar side of the palm. The edges of the wound are everted, and it can be seen that the infection has extended down to and involved the tendon sheath. The infection has also extended farther down to the midpalmar space and to the extensor surface of the finger (Fig. 467).

Comments.—The case is one of acute extending infection of the tendon sheath of the little finger. The patient shows a swelling below the web of the fingers and tenderness extending to the base of the ring-finger. I am inclined to believe that, while the infection has extended down to the sheath on the phalanx, the midpalmar space is not involved, but that the infection has extended to the subcutaneous tissue of the palm and posteriorly to the subaponeurotic space.

I show this case because it is a typical example of the wrong method of treatment. One must never make an incision on the flexor surface of the finger and never over the flexion crease, that is, over the joint. Make the incision laterally. In this case the surgeon should have made a superficial incision into the subcutaneous tissue, because the infection primarily involved the subcutaneous space below the web. Having opened the tendon sheath of the finger, the infection was permitted to extend along that tract, destroying the flexor tendon.

There are some remarks I would like to make in connection with this case. Never stab carelessly into an infected finger with the object of locating pus. Every case of infection of the hand or fingers should be given an anesthetic and a clean-cut incision or, rather, dissection made. Incise the skin and dissect carefully the fascial planes and stop as soon as pus is found. Then enlarge the incision to the desired depth and width. I have seen fingers cut again and again fruitlessly. Why? Because the patient is usually nervous from the throbbing pain and loss of sleep, the surgeon is eager to have the ordeal over with, no anesthetic is given, and as a result a false stab is made, and the patient goes away more nervous and with more pain and without proper drainage. "The blade of the knife is not sensed with vision," said the late Dr. J. B. Murphy, "and to thrust a blind knife blindly into a human hand is nothing if not criminal, and, therefore, every acute deep infection of the hand should be treated by exploratory dissection under anesthesia and anemia." Permanent loss of function is due more to the surgeon's knife than it is to the infection itself.

Every opening must be made large enough. A drain must be inserted and then hot dressings applied. What happens when no drain is inserted and dry dressings applied? The edges of the wound become edematous and exude a serum which coagulates and seals up the opening. That is why hot dressings should be applied. It keeps the coagulum in solution and does not permit sealing. An important point to which I wish to call your attention is the flow of serum from the wound. Wright maintains that as long as serum is permitted to exude from an infected wound the condition is favorable. The serum bathes the wound and brings the lymph to the surface.

When its excretion is interfered with or is permitted to coagulate upon the surface of the wound, the infection takes a centripetal course. That is what is meant by the term "lymph-bound." Moynihan describes it very lucidly, "A mesh of fibrin entangles the blood-cells and a sort of matting of coagulated lymph spreads over all the surface. No fresh serum can then reach the wound, or are fresh leukocytes available for the attack." The infective process can then proceed without the inhibiting effect of the two strongest agencies, namely, the phagocytic action of the leukocytes and the bactericidal action of the serum. When a hypertonic salt solution is applied to an infected surface it stimulates the tissues, and the reaction brings about an increased flow of serum and lymph, together with a fresh supply of leukocytes, the reserve force of defense. The therapeutic value of salt in the treatment of infected wounds has long been recognized, although its use has been abandoned until now, when it has become a popular agency in war surgery.

CASE II.—**Acute Infection of the Index-finger.**—This patient is a laborer, who some six or seven days ago scratched the index-finger of his right hand. The finger became painful and swollen, the swelling limiting itself to the proximal phalanx of the finger. There is some tenderness of the palm present.

Examination.—There is some fluctuation at the proximal phalanx of the index-finger, with tenderness and swelling below the proximal crease. Two incisions were made, one to the radial side of the finger and the other on the ulnar side dorsally (Fig. 468).

Comments.—This is a case which illustrates an infection limited to the superficial structures involving the lumbrical spaces. The tendon sheath here is not involved and the infection has not extended to the thenar space. The treatment adopted shows that by opening as we have done the infection has been arrested and confined to the superficial structures. I call your attention to the fact that by pressure at the base of the finger over the lumbrical space pus can be expressed through the incision, while pressure over the thenar space will not produce the same effect. This point has already been referred to in the general remarks.

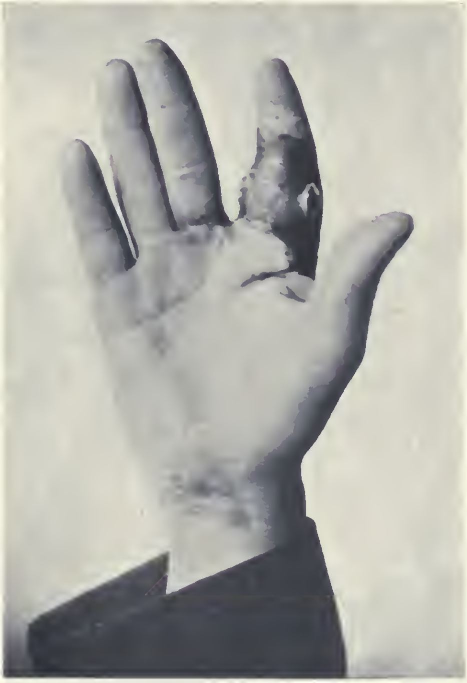

Fig. 468.—Infection of the index-finger, with swelling of the proximal phalanx and base of the finger. Incision made laterally below proximal crease.

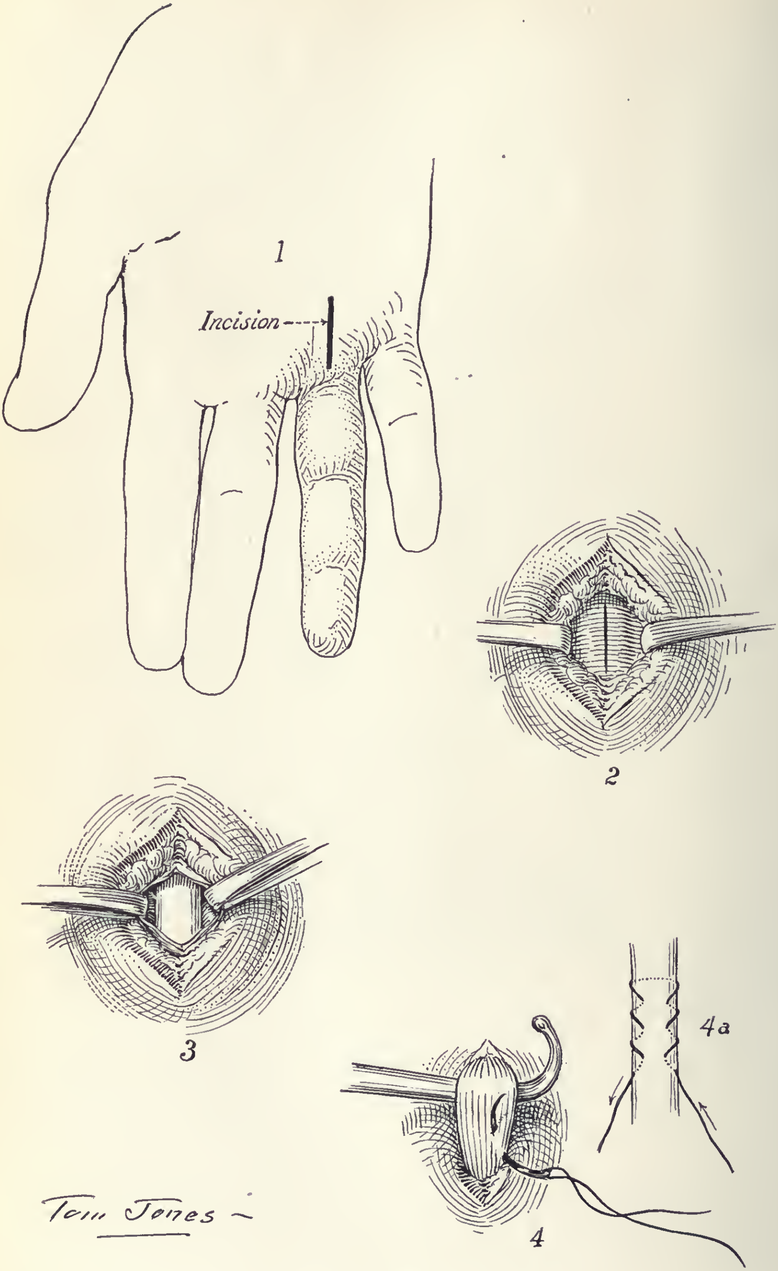

Fig. 469.

Case III.—**Destruction of Tendons as a Result of an Infection of the Ring-finger—Tendon Transplantation.**—This patient is a brass-worker. About three months ago he cut the ring-finger of his left hand on the flexor surface of the proximal phalanx. On the fourth day the finger became painful and tender, the tenderness extending along the flexor surface of the finger and radiating to the palm. There was an escape of pus from the original opening. The factory doctor opened the wound in a transverse direction and inserted a drain. The opening healed in three weeks, leaving a very small scar, but he was unable from that time on to either extend or flex the finger.

Examination.—The finger is not ankylosed. There is no atrophy, but a small furrow is found upon the flexor surface of the proximal phalanx. There is some motion at the base of the finger.

Comments and Operation.—The case is one of loss of function arising from infection of the tendon sheath of the ring-finger. The tendons in this man's finger have been either cut or destroyed by the infection. If the tendons were not cut during the accident, they were by the physician who originally handled the case. A transverse incision should never be made through a flexor surface of a phalanx. I do not believe that the ends of the tendons can be approximated, so a tendon transplantation will be attempted.

I am going to transplant a portion of the extensor tendon from his foot to replace the tendon which was destroyed by the infection. This operation was described by Bunnell, of San Francisco, who claims very satisfactory results. I am not going to deviate much from his technic, except to introduce a method

Fig. 469.—A method for direct transplantation of tendons from the foot to the hand. Note in 2 that a separate incision is made through the sheath, and that the forceps in 3 are placed upon the retracted edges of the sheath. Note also that the needle is introduced inward and upward for a distance of one-third the width of the tendon, sliding the probe upward with each introduction of the needle (4). After passing the needle through the full width of the tendon at its upper pole the first bite is taken from within out, giving the appearance of a "herring-bone stitch" in the final result. By holding the tendon with the hook the needle can be introduced without the tendon slipping from the field.

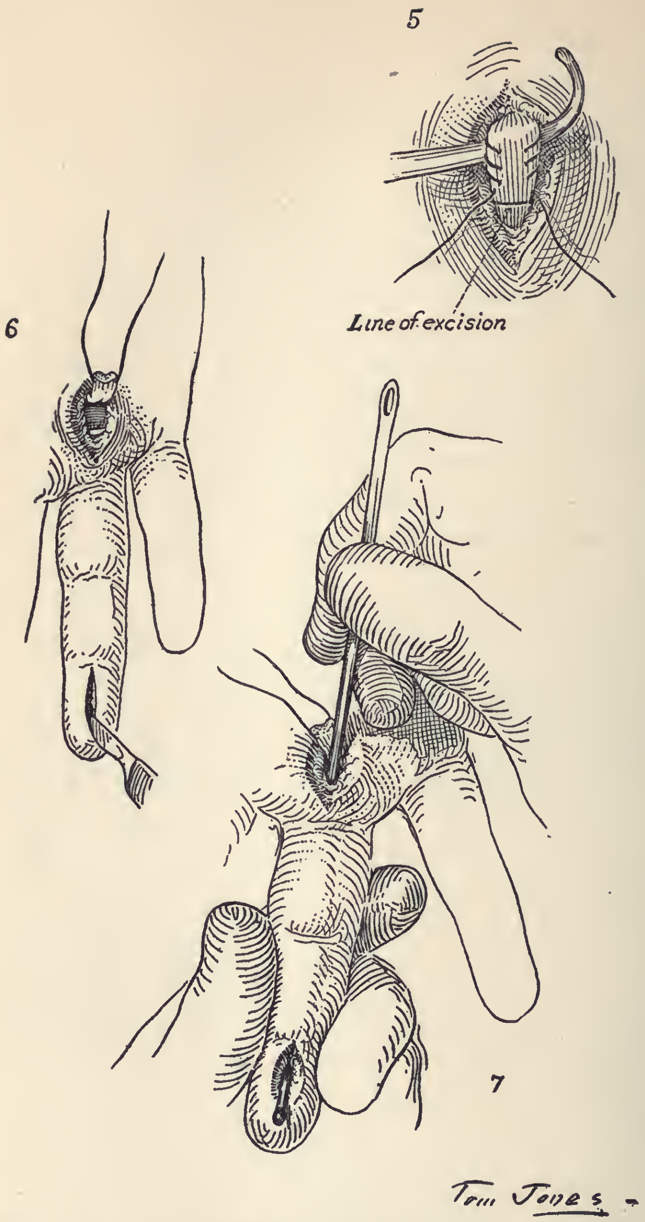

Fig. 470.—5. The sutures are in place and the tendon is cut across. 6. Incision is made distal to the interphalangeal joint down to the periosteum. The upper portion of the illustration shows the distal portion of the flexor tendon with sutures inserted. 7. Probe is passed beneath the flexor tendons to the tip of the finger. The probe is to be moved from side to side to permit easy entrance of the transplant. The finger is to be hyperextended to make the probe pass more easily

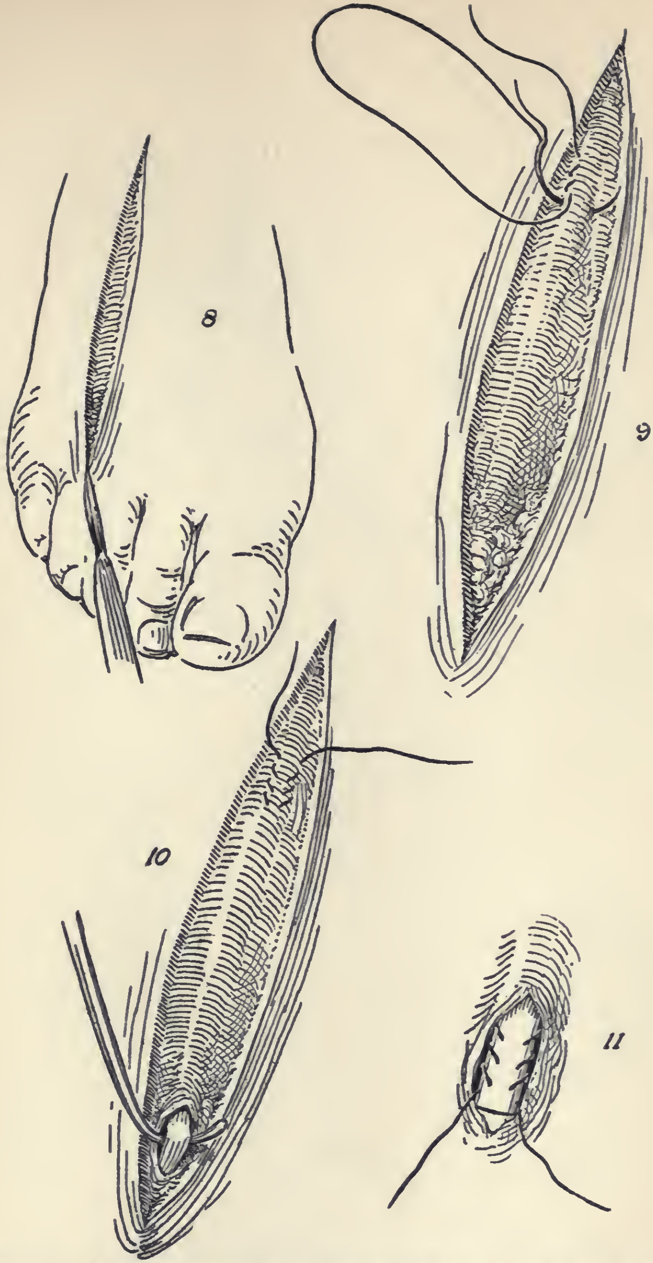

Fig. 471.—8. Incision made over the tendon of the fourth toe down to the deep fascia. The fourth toe is to be held down with the operator's left thumb, so as to put the tendon on tension. 9. The sutures are introduced in the upper pole of the transplant through the surrounding tissue, sheath, and body of the tendon. 10. The sheath is opened in the lower pole, allowing the proper length of tendon for the transplant. The hook is introduced and the tendon brought out into the field. The sutures are inserted as in Fig. 469, 4*a*. 11. The sutures in place and the tendon cut across.

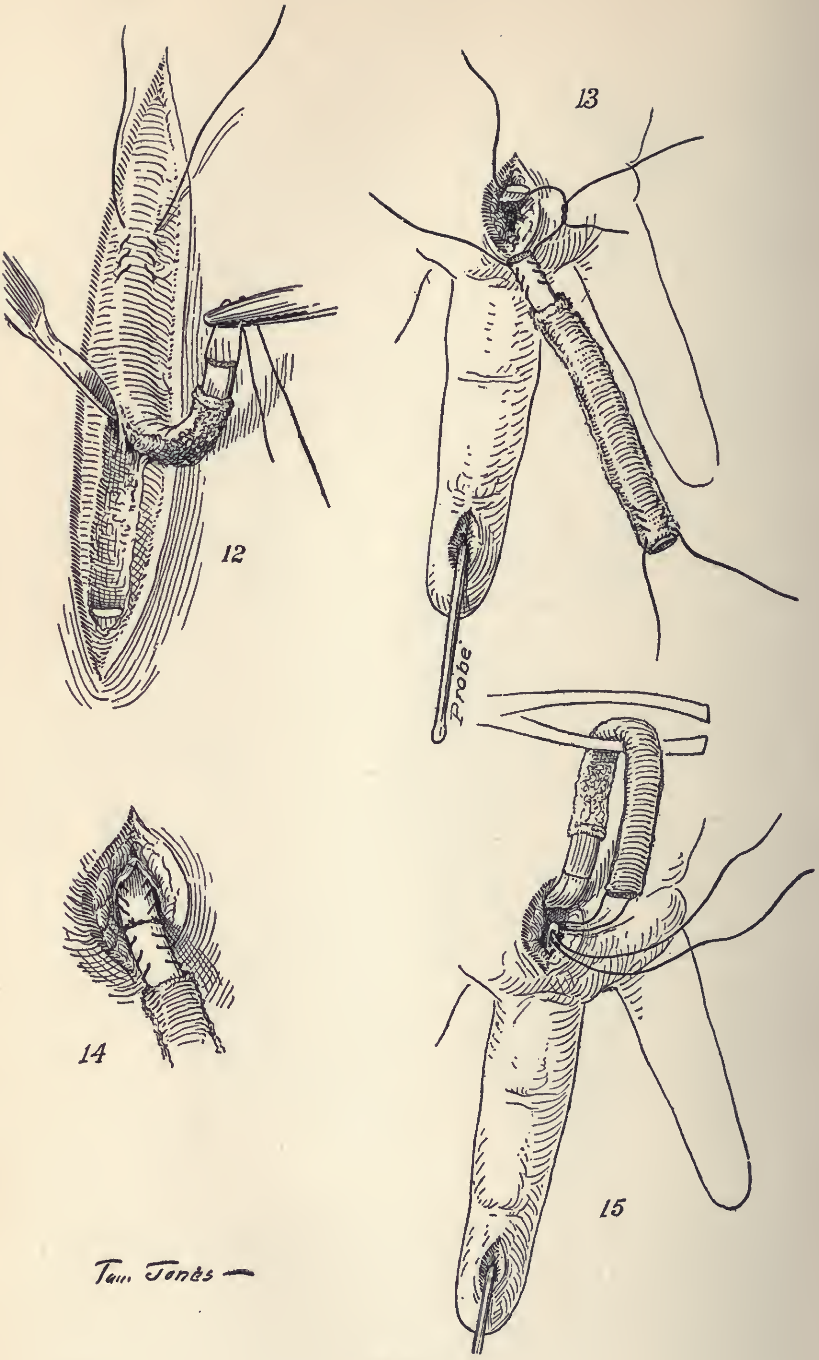

Fig. 472.

of suture which I believe has not been described before. The difficulty in transplanting tendons which are the size of the tendons of the toes or fingers is in their suture. It is difficult to control such a tendon, and Bunnell has devised two very ingenious clamps which hold the tendon ends and facilitate suturing. If the sutures are introduced before the tendon is severed, their introduction is greatly facilitated, and one does not need these clamps.

We will make the first incision below the proximal crease of the ring-finger, extending down to the sheath of the flexor tendon for the distance of about ½ inch (Fig. 469, 1). We will now make an incision through the sheath, exposing the tendons (Fig. 469, 2 and 3). A curved hook is passed beneath the tendons, and they are brought out into the wound (Fig. 469, 4). We will proceed to introduce the sutures by means of a fine French curved needle, using very fine silk. Now the sutures are introduced (Fig. 469, 4*a*) and we are ready to sever the tendon at the distal portion (Fig. 470, 5). It must be remembered that the introduction of the sutures must be carried out before the tendon is severed. The tendon is now cut (Fig. 470, 6), and an incision is made beyond the distal flexion crease to the periosteum of the terminal phalanx. An eye-probe is now passed along the flexor surface of the finger and brought out at the distal phalanx (Fig. 470, 7). The finger must be overextended to permit the passage of the probe.

The foot is now prepared for the transference of the tendon. The fourth toe is held down with the thumb of the operator's left hand and an incision is made through the skin and superficial fascia over the extensor tendon (Fig. 471, 8). The sutures are inserted (Fig. 471, 9) through the upper pole of the tendon. This suture is introduced into the peritendinous tissue and

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Fig. 472.—12. The tendon is handled by means of the inserted sutures. Incisions are made on either side of the tendon carrying the sheath and peritendinous tissue with it. 13. The transplant is brought out over to the hand and the sutures are tied in square knots and placed between the approximated tendon ends (14). 15. Probe is threaded and the tendon is drawn down into the canal made by the probe.

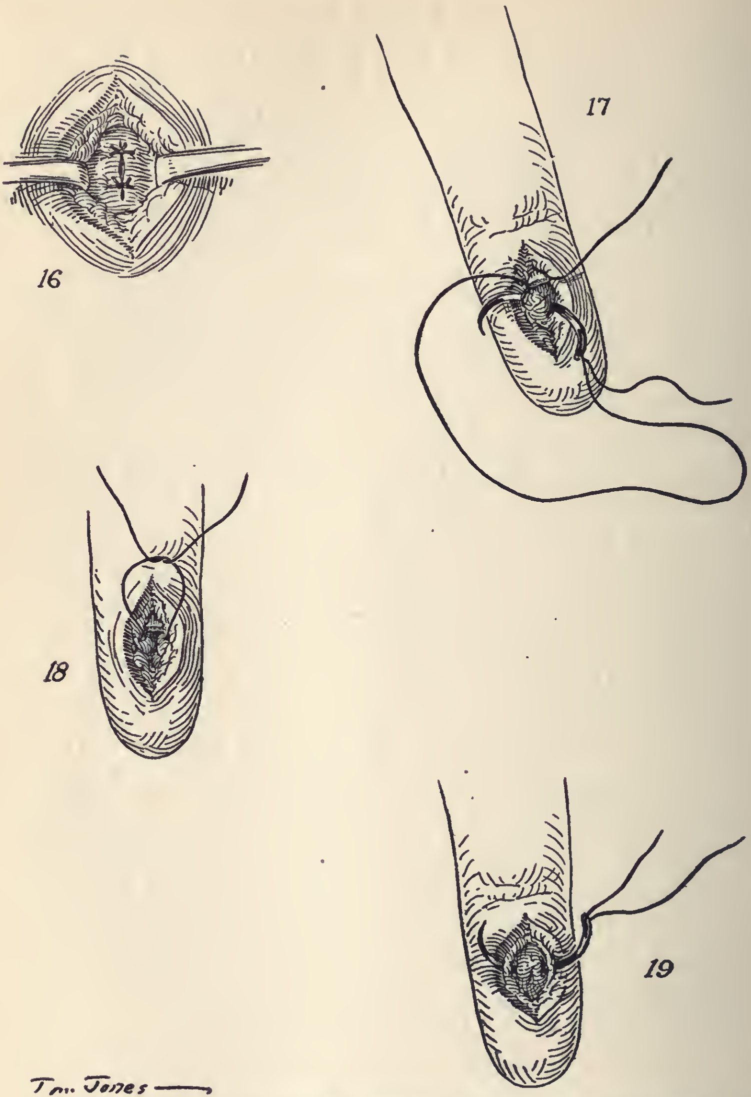

Fig. 473.—16. Sheath in the palm is closed with two catgut stitches and the skin with horsehair. 17. One end of suture is threaded and inserted into the deep tissues of the distal phalanx. The other end of the suture is threaded separately. 18. The ends are tied. 19. The deep tissues are closed by one catgut stitch.

tendon. The method of insertion of the sutures is the same as in Fig. 469, 4*a*. The tendon is measured for the desired length, and the sheath is opened at the lower pole of the tendon and the tendon brought out by means of a curved hook (Fig. 471, 10). The sutures are introduced in the exposed tendon, as shown in Fig. 471, 11. The removal of the sheath from this portion of the tendon (Fig. 471, 11) is done to prevent its interposition when the two ends of the tendon are brought together in the hand. The tendon is now severed at the lower pole and the incision carried to either side of the tendon, carrying the sheath and surrounding tissue with it (Fig. 472, 12). The tendon is handled by means of the retention sutures to avoid unnecessary handling of the tendon proper. The sutures of the transplanted tendon are now tied to the distal end of the tendon in the hand (Fig. 472, 13) and the ends buried (Fig. 472, 14). The probe is then threaded and the tendon is brought into the canal made by the probe (Fig. 472, 15). The sheath is closed by two catgut sutures (Fig. 473, 16). The distal end of the transplanted tendon is then sutured to the deep tissues above the distal crease in the proximal phalanx (Fig. 473, 17). First, one end of the suture is threaded and then the other, and it is tied as shown in Fig. 473, 18. The deep tissues in the distal phalanx are closed with catgut (Fig. 473, 19) and the skin incisions with horsehair.

Postoperative Comment.—Motion was begun the second day after operation. The patient states that he can feel the tendon pulling clear to the tip. We will institute daily exercise from now on, because upon this early motion we have reason to believe that the efficacy of the functional results will depend.

CASE IV.—**Ankylosis of Index-finger.**—This patient is twenty-seven years of age, by occupation an accountant. About five years ago he sustained an injury to the palmar surface of his left index-finger, with a bruising of the skin. Two days later the finger became painful and swollen, the swelling extending to and involving the palm. The second finger also became painful and swollen. He had a high temperature and chill and was very sick. The swelling and pain continued for about five days, when he consulted a physician, who opened and drained both the finger and hand. Pus escaped for six weeks, during which time the finger became contracted and has remained so to this day.

Examination.—The finger is atrophied in the flexor surface, so that a groove could be felt along the first and second phalanges. The proximal joint is ankylosed and subluxated, so that the finger points in an angular manner into the palm (Fig. 474).

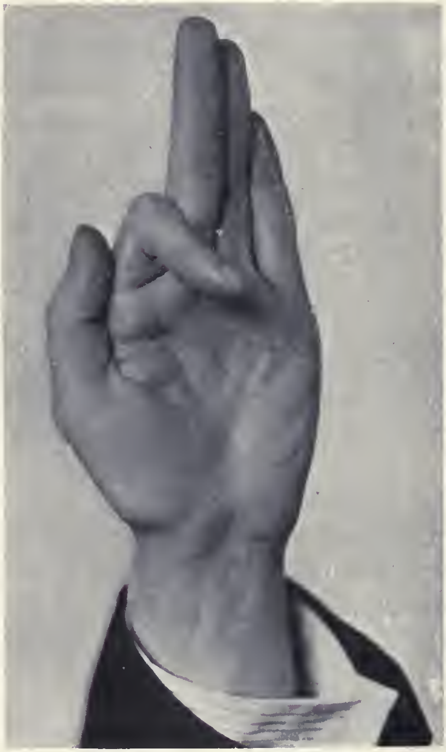

Fig. 474.—Photograph of index-finger in Case IV before operation.

Comments and Operation.—This case, like the last, is one of deformity resulting from a hand infection. The finger is constantly in his way, and is, therefore, a useless member. What can be done with this finger? Amputation is a deforming operation to him, but it would in a way be the most desirable from a surgical standpoint. The patient, however, does not want it, and would rather submit to any plastic work which will offer a chance of probable improvement. We can promise him a straight finger, but one that is straight without motion is likewise undesirable because of the danger of fracturing it.

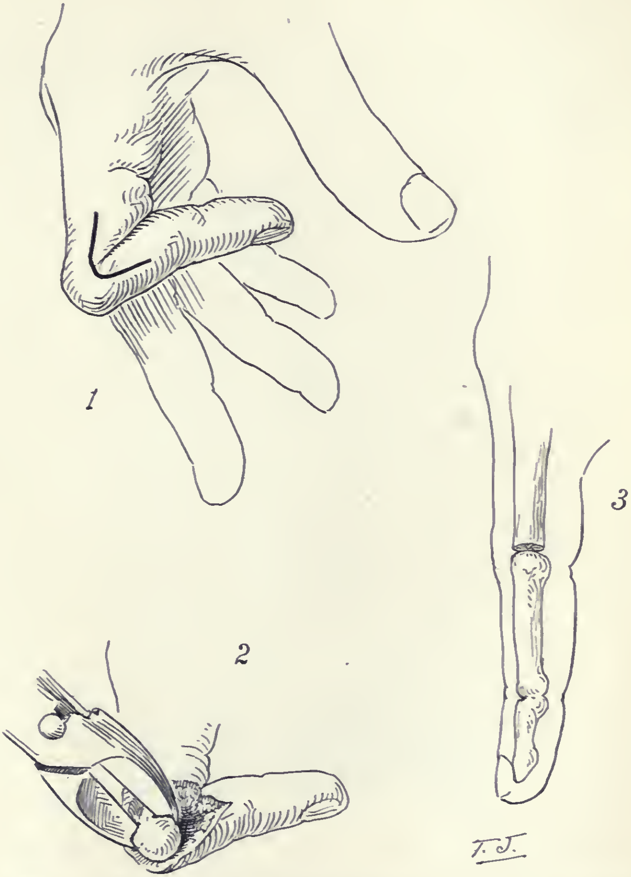

Fig. 475.—1. Line of incision over ankylosed joint. This is carried down to the bone surface. 2. Method of removing articular surface of proximal phalanx by means of the bone-cutting forceps. 3. Schematic drawing showing the relation of the proximal phalanx after removal of the articular surface to the second phalanx.

If one articular surface is removed and fat and fascia interposed, the joint will have some degree of motion.

We make our incision laterally over the proximal joint (Fig. 475, 1). Here is the ligament binding the joint. We will retract the extensor tendon, which now appears in the incision, and insert these bone-cutting forceps (Fig. 475, 2) and remove the articular surface of the first phalanx. We have removed enough bone so that the joint is loosened. We will now cut these bands on the flexor surface of the finger which limit the extension. We take care not to injure the skin, which is very thin at this point. Now the joint is free and we can extend the finger (Fig. 475, 3). We will now perform a similar operation to the one we did in the previous case (Figs. 469–473). I fear the motion will not be as great as in the former case, because a considerable degree of trauma has been done to the skin at the

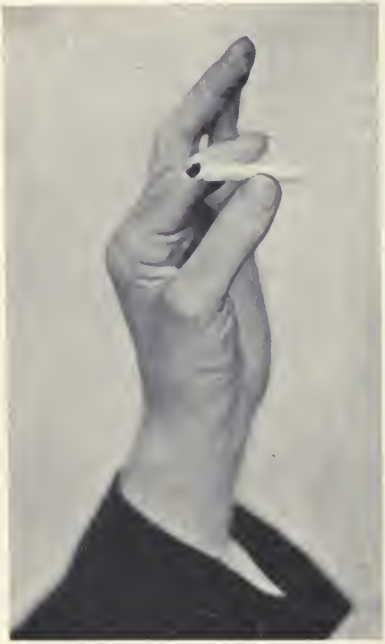

Fig. 476.—Final result of Case IV three weeks after operation.

proximal phalanx, which was adherent to the bone and became thinned out. The operation is worth doing. Perhaps the time will come when we will be able to restore function to all useless members.

Postoperative Comments.—A slight slough occurred at the point where the skin was thin. Healing was complete in about eleven days. He can move his finger and can do a number of useful things with it (Fig. 476).

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